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THE INDUSTRIAL ARTS MAGAZINE

NOVEMBER 1923

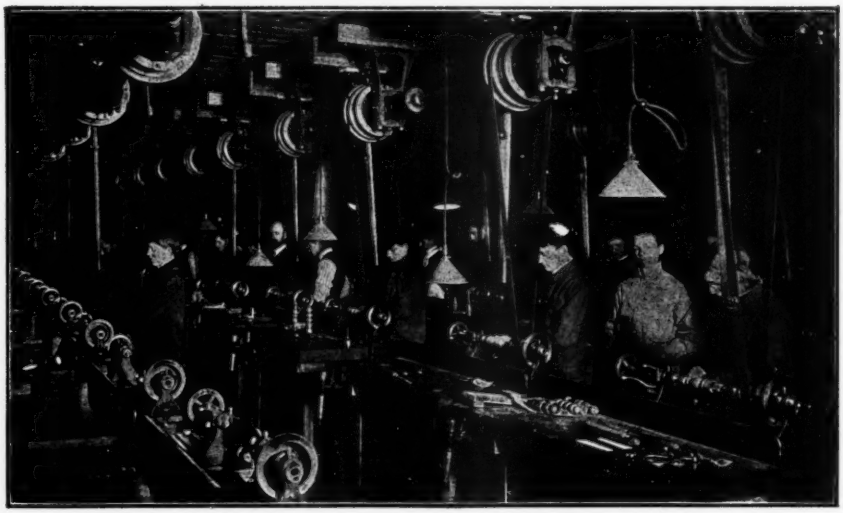
THE BRUCE PUBLISHING COMPANY
MILWAUKEE ▪ WISCONSIN

H.W. JACOBS.

THE JOHNSON FRICTION CLUTCH

IN SERVICE FOR FIFTEEN YEARS

IN THE MANUAL TRAINING DEPARTMENT OF THE STUYVESANT HIGH SCHOOL, NEW YORK CITY



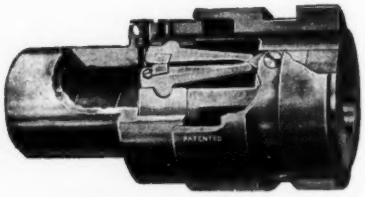
Courtesy: The Stuyvesant High School, New York, N. Y.
(View of original installation in old building.)

A record like this ought to convince even the most skeptical that the Johnson Friction Clutch is a money saver and not an expense.

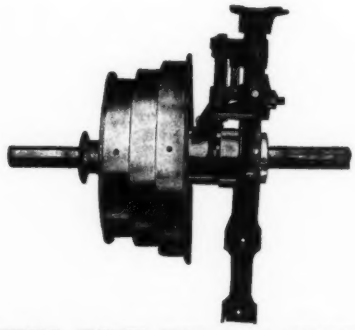
Equip your shafting with Johnson Clutches and forget your troubles.

Any size of steel split, solid iron or cone pulleys may be mounted on the Clutch hub.

Write for "IAM" Catalog.



SINGLE CLUTCH, SECTIONED.
Single Clutches for line shaft drives where high speed is desired.



SINGLE CLUTCH WITH CONE PULLEY MOUNTED AND STYLE "A" SHIFTER BRAKE MECHANISM.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.

Johnson's Artistic Wood Finishes are very easy to use. Boys in the Fifth and Sixth Grades can use them successfully. Simple instructions are printed on every label. Whenever specific information is desired — do not hesitate to write us. Our Individual Advice Department will gladly help solve your wood finishing problems.

Johnson's Artistic Wood Finishes are economical because they always give satisfaction. The cost of finishing material for an article of furniture is such a small percentage of the entire cost, that the best finish obtainable is none too good. Reliable, high quality wood finishes such as Johnson's are always more satisfactory.

All of Johnson's products may be quickly used—models may be finished with Johnson's Wood Dye and Prepared Wax in one period. This is particularly advantageous in crowded centers, and in grade work, where it is necessary to hold the attention of the children. It does away with the necessity of having models laying around to dry.

FREE - Book on Wood Finishing

THE finishing of manual training models is assuming more and more importance every year. Surely it is a subject which should be given its share of attention, for a beautiful model may be ruined if improperly finished, whereas the defects of a poorly constructed model are minimized if well finished.

Our Book on Wood Finishing is a valuable text book and should be in the hands of every Wood Finishing Instructor. It is full of information on finishing all wood—soft and hard. It is the work of experts—profusely illustrated in color.

JOHNSON'S *Artistic* WOOD FINISHES

Johnson's Artistic Wood Finishes are now being used in nine-tenths of the schools in the United States and Canada. They are particularly adapted for manual training work as they may be applied by the youngest and most inexperienced pupils with good results.

The finishes most popular among Manual Training Instructors and Pupils are:—Johnson's Wood Dye, Prepared Wax, Under-Lac, Paste Wood Filler, Varnishes, Perfectone Undercoat and Enamel. We have a very atractive exhibit of wood panels finished with these products which we are glad to send, free and postpaid, to Manual Training Instructors who will give it wall space in their shops.

S. C. JOHNSON & SON, Dept. I. A. 11, Racine, Wis.
"The Wood Finishing Authorities"

Please send me free and postpaid your authoritative book on Artistic Wood Finishing as applied to manual training work.

We buy stains and varnishes from.....

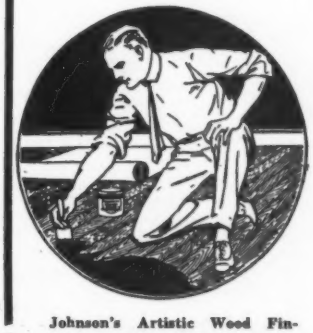
My Name.....

My Address.....

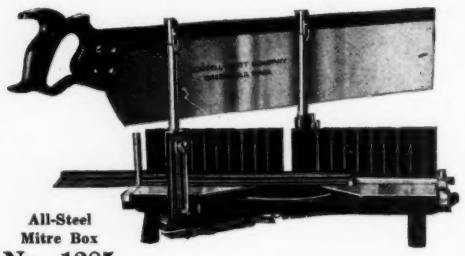
City and State.....

Johnson's Wood Dye is manufactured in fourteen shades and Johnson's Paste Wood Filler in five shades. All shades of Wood Dye may be easily lightened or darkened. Complete instructions are given on every label. By lightening, darkening and intermixing, hundreds of different shades are easily obtainable.

With Johnson's Wood Dye it is both possible and practical to finish up complete turned articles such as lamp stands, candle sticks, etc., while they are still in the lathe. Johnson's Wood Dye penetrates Deeply — brings out the beauty of the grain without raising it in the slightest—dries in four hours and does not rub off or smudge.



Johnson's Artistic Wood Finishes are being used all over the world by artisans and amateurs. Architects and contractors specify Johnson's line for coloring woodwork and flooring in new buildings. Painters and decorators use Johnson's Wood Finishes with equal satisfaction on new and old work. Upholsterers, furniture repairers and cabinet makers find it "just the thing" for their use.



All-Steel
Mitre Box
No. 1285
Price, $25.00

No matter what the angle—

Use this Goodell-Pratt Mitre Box, the only all steel mitre box made. Trussed like a steel bridge.

Makes a clean, smooth cut at any angle between 45° and 90°—right or left. An extra angle attachment enables the workman to saw at more acute angles. All angles are indicated on a graduated arc.

This mitre box is equipped with a high-grade Back Saw. The saw can be locked at any angle and is held by a spring which is released by a slight downward pressure of the hand.

The steel bottom plates are scored to keep the work from slipping, and the stops can be regulated to saw to any desired depth.

1499 other good tools

No matter what kind of shop work your curriculum calls for, there is a Goodell-Pratt Tool made to do that work quickly and right.

Mr. Punch Says:
"When I see a good mitre box being used I know that the students are being trained to use and appreciate good tools."

Write today for complete details of this All-Steel Mitre Box and whatever other tools your school may be interested in. Our free Catalog No. 15 shows "1500 Good Tools." Write for it.

GOODELL - PRATT COMPANY
Toolsmiths
Greenfield, Mass., U. S. A.

GOODELL-PRATT
1500 GOOD TOOLS

MAYDOLE HAMMERS
THE WORLD'S STANDARD

There are none better made—none better known. When you buy these hammers, you are certain of getting the best. They are used the world over.

Maydole Hammers are made of finest quality material, and guaranteed first-class in every respect.

Write for our booklet of useful information, which every student should have. How many shall we send?

The David Maydole Hammer Company
NORWICH NEW YORK U. S. A.

AS IT LEFT THE MAKER

When you use the Morrill sawset you have the positive assurance that your saw will be set just right. Too much set makes the saw run hard with a ragged cut. Too little set makes the saw bind and not cut at all, but the Morrill set makes the saw run sweet and easy, and cut clear and straight.

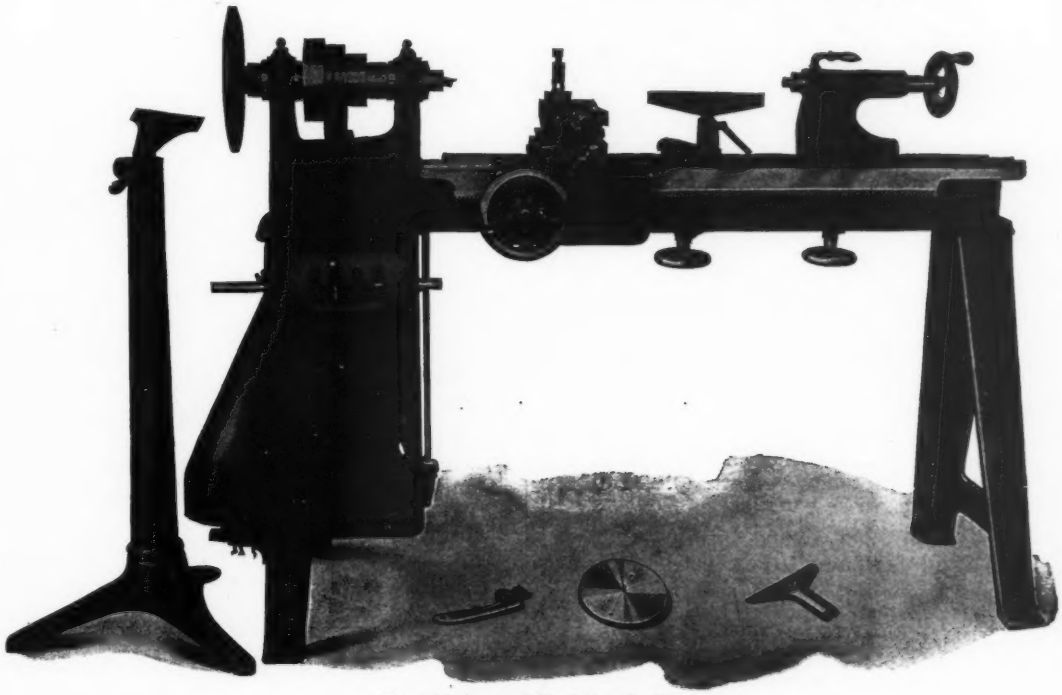
"Saw Points," a booklet on "How to Joint, Set and File Saws" and used by many Manual Training Teachers as a Text Book, will be sent free to any teacher upon request.

"Special" and No. 1 for Hand Saws not over 16 gauge.
No. 3 for Cross Cut and Circular Saws 14 to 20 gauge.
No. 4 for Double Toothed Saws 14 to 20 gauge.
No. 5 for Timber and Board Saws 6 to 14 gauge.

Our name Morrill and trade mark is stamped on every tool of our manufacture.

CHAS. MORRILL
94 La Fayette St. New York, N. Y.

Picture This Lathe Turning Out Work In Your Manual Training Shop!



No. 218 Manual Training Lathe

HERE ARE A FEW OF THE THINGS IT DOES:

Wooden Work

Baseball bats, candle sticks, wooden platters or bowls, fancy rungs for chairs, table legs, etc., floor lamps and bowling pins. This machine has a 12" swing and is 36" between centers, which allows many things to be made which can't be handled on a smaller lathe.

Metal Work

Any light metal cutting within the capacity of the machine.

Spun Metal Work

High speed (3,131 R. P. M.) makes it available for this work.

Finally, it protects the boys.

It is carefully designed so that the working parts are as much under cover as possible. For example, the speeds can be changed and the machine stopped by use of handle shown. A switch controls the motor.

ENCOURAGE ORIGINALITY IN THE SHOP

The best way is by having available machinery which is varied enough in its application to enable the boys to work out what they think up. Our machine has been carefully planned to give it the widest possible variety of uses consistent with its reasonable price. To do this we have had to design a machine of exceptionally sturdy construction in order to meet the varied demands made upon it.

Our bulletin, "218 Manual Training Lathe," gives all the details of construction and equipment. Send for a copy.

GTD Corporation
Greenfield, Mass.

☐ Please send me your data sheet on 218 Manual Training Lathe.

☐ I would like details of your other Manual Training Lathes, too.

Name.....

School.....

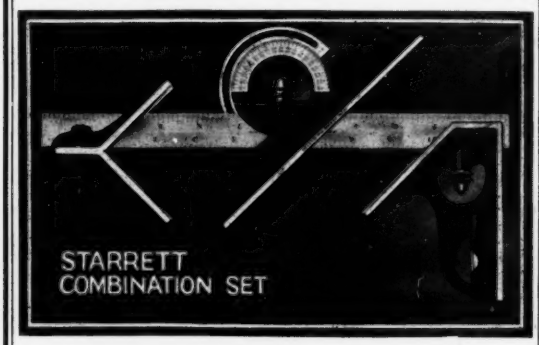
City..... State.....

I.-A. 11

MACHINE TOOL DIVISION

GREENFIELD TAP AND DIE CORPORATION
GREENFIELD, MASSACHUSETTS

GTD TAPS • DIES • SCREW PLATES • TWIST DRILLS REAMERS • PIPE TOOLS • MILLING CUTTERS



"The most useful tool ever built"

You ought to own one of these famous Starrett Combination Sets.

With its Drop Forged Steel Combination Square, Reversible Protractor Head and the Center Head here's a practical, handy tool that for general all-round work has yet to be equalled.

The Combination Square (with Spirit Level and Scriber in the Head) alone gives you seven tools in one. *Rule, Square, Miter, Depth Gage, Height Gage, Marking Gage, Level and Plumb.* Add the Protractor and Center Head and you've got a set of accurate tools that you'll use constantly in a hundred and one different operations.

And useful as it is, the Starrett Combination Set (No. 434 is illustrated) takes up but little room in your kit and saves littering the bench with the separate tools needed to do the same work. Heads slide easily along the Blade and can be instantly removed or clamped at any desired position. All parts nicely finished, of the best workmanship and reliably accurate. For doing close work *easier* you'll find the purchase of one of these Starrett Sets the best investment you ever made.

For complete description of the different Starrett Sets and Attachments write for the Starrett Catalog No. 22-CE.

THE L. S. STARRETT CO.

The World's Greatest Toolmakers
Manufacturers of Hacksaws Unexcelled

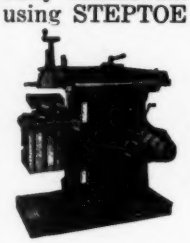
ATHOL, MASS.

Starrett Tools

5760

SHAPERS MILLERS ENGINE LATHES

Moderate price machine tools — practically fool proof — ideally suited for school shops. Thousands in use all over the world giving daily satisfaction. Send for list of schools using STEPTOE equipment.



Descriptive catalogue and full particulars furnished upon request.

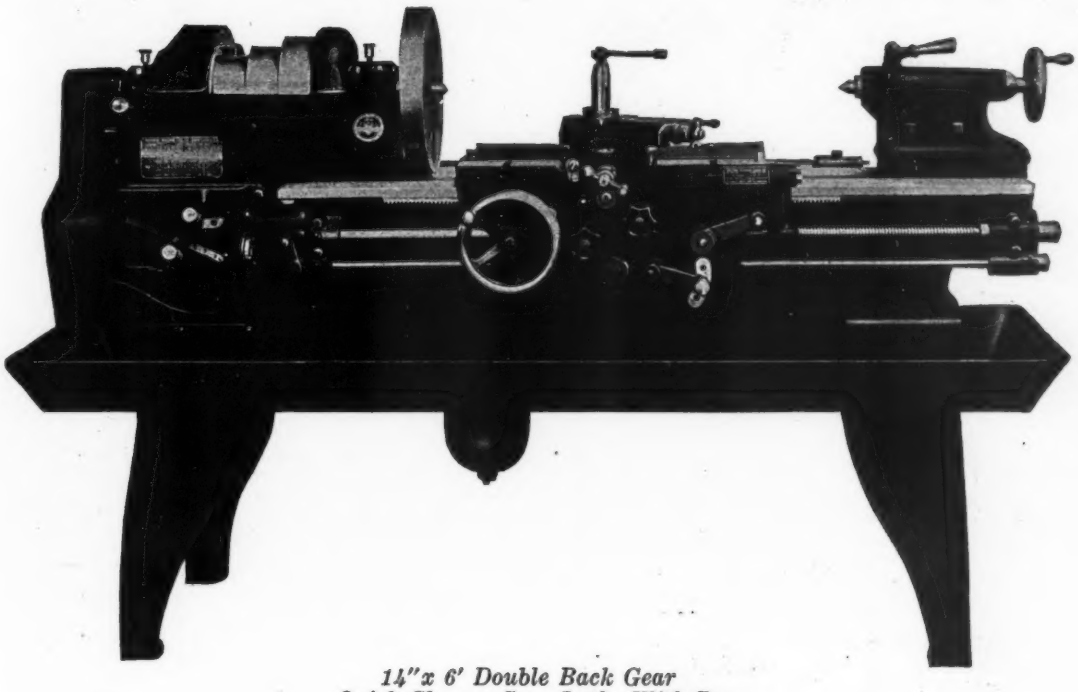
Industrial Education Department

THE JOHN STEPTOE CO.
CINCINNATI :: :: OHIO

"STAR"
Hack Saws

The Blade with a Reputation is built upon the metal cutting performance record of forty years. STARS cut faster and cut longer. Personal service, information, advice and price lists on all Hard and Flexible Hand Blades, and on Power Blades, sent on request.

CLEMSON BROS., Inc.
MIDDLETOWN, N. Y.
Makers Since 1883



14"x 6' Double Back Gear
Quick Change Gear Lathe With Pan

More Monarch Lathes are being used in manufacturing plants throughout the country than any other make. More Monarch Lathes are being installed in Manual Training Departments of schools than any other make of lathe. The student, upon completion of his school work, will find himself coming in contact with Monarch Lathes in most shops.

Monarch Lathes are built in sizes ranging from 9 inch to 30 inch swing, and bed lengths from 2½′ to 30′.

Our Engineering Department will gladly submit plans and layouts for machine shop installations and we are in position to give Vocational Instructors valuable information and plans, for which no charge is made.

There is a Monarch Dealer near you, who will gladly show you the merits of Monarch Lathes.

Let us send you Special Vocational Bulletin.

THE MONARCH MACHINE TOOL CO.

304 OAK STREET **SIDNEY, OHIO**

Largest builders of high grade engine lathes and specialist in lathes for Vocational Training.

Renewable Jaws That *Cannot Work Loose*

One of Seven Superior Parker Features

Milled to fit and ***pinned on***, not cast or screwed on. Parker Jaws set as firmly as though a part of the vise casting, yet are easily removed for renewing. Made of tool steel and cover the entire top of the vise.

Ask us about the type of Parker Vise best suited for YOUR school work.

The Charles Parker Company
Master Vise Makers
Meriden, Conn. U. S. A.

PARKER VISES

Grip Like a Grizzly

V&B Braces

Do you have trouble with your end screw attachment? V & B Braces, with their patented key construction, make such troubles a thing of the past. A quality tool, of course!

VAUGHAN & BUSHNELL MANUFACTURING COMPANY
Makers of Fine Tools
2114 Carroll Ave. ~ Chicago, Ill. U.S.A.

SHEET METAL WORKING MACHINES & TOOLS

Standardize on Niagara Bench and Hand Tools

The Niagara line of bench machines and hand tools for sheet metal is so complete that you can standardize the entire equipment of your shop, making sure that every operation is done in the most efficient manner.

Among the Niagara machines for sheet metal working are the following:

Folders	Groovers	Squaring Shears
Brakes	Seamers	Lever Shears
Burr Machines	Forming Rolls	Lever Punches
Wiring Machines	Stakes	Roofing Tools
Turners	Snips	Slaters' Tools
Crimpers	Bench Shears	Stove Pipe Machinery
Beaders	Hand Tools	Elbow Machinery

All these and many more are shown in our Handy Reference Catalog No. 56—send for free copy.

NIAGARA MACHINE & TOOL WORKS
Established 1879
BUFFALO, N. Y., U. S. A.

NIAGARA

Overlook This

and you overlook one of the best courses for Manual Training Workshops

A large number of the foremost schools in the country (public and private) have come to realize this fact and are teaching ***Sheet Metal Working*** in their Manual Training Department. They realize sheet metal is rapidly taking the place of wood in most every industry and mechanics knowing this trade are in great demand.

The work is healthful, the hours short, and pay ranks high among the best paid trades.

The initial equipment required costs far less than any other equipment you could install considering the results obtained. The supplies necessary to carry on the course cost very little.

We will be glad to furnish an estimate on sufficient machines and tools to cover your needs upon receipt of number of pupils to be taught.

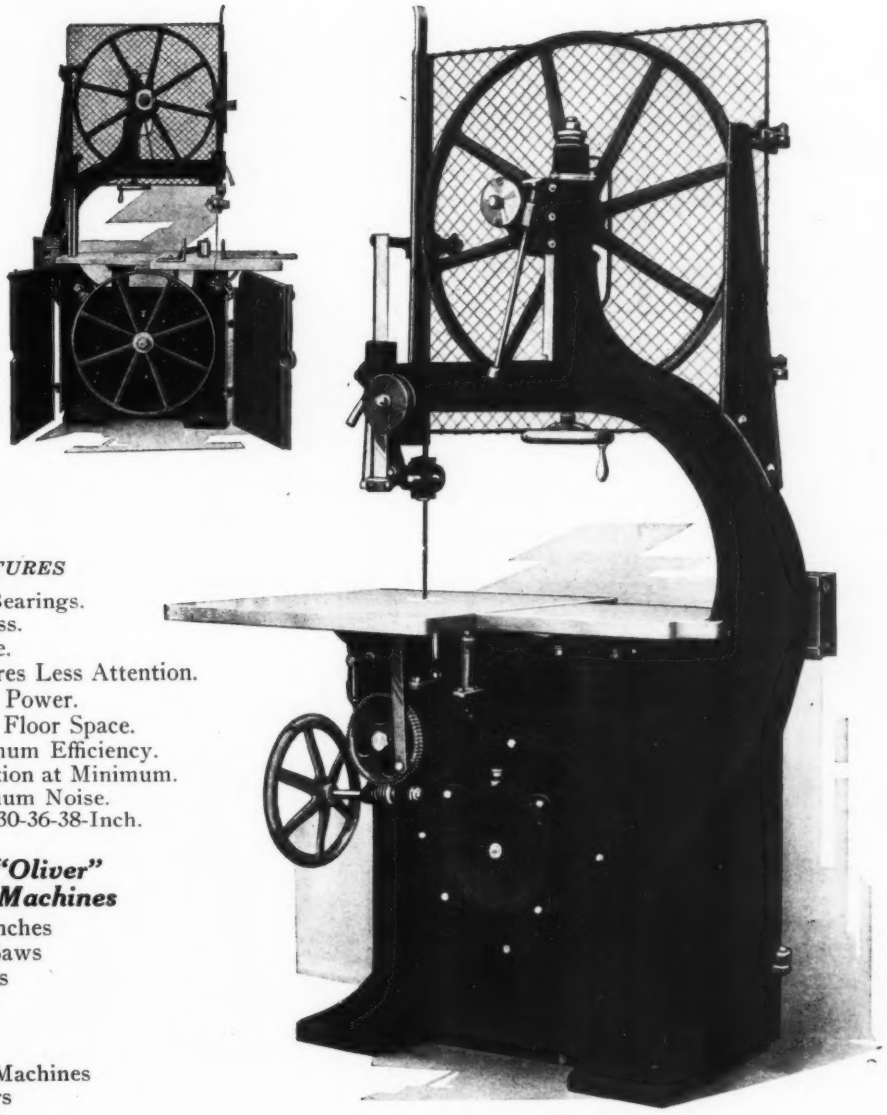
At least send for literature on the subject.

BERGER BROS. CO.

"EVERYTHING FOR THE TRADE"

229-231-233-235-237 Arch Street,
PHILADELPHIA.

"OLIVER" ELECTRIC BAND SAWS



FEATURES

1. Ball Bearings.
2. Beltless.
3. Simple.
4. Requires Less Attention.
5. Saves Power.
6. Saves Floor Space.
7. Maximum Efficiency.
8. Vibration at Minimum.
9. Minimum Noise.
10. Built 30-36-38-Inch.

Other "Oliver" Electric Machines

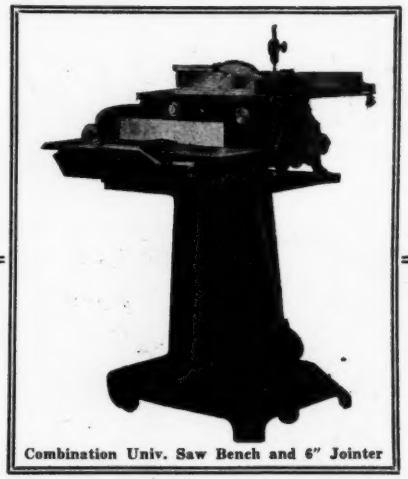
Saw Benches
Swing Saws
Surfacers
Jointers
Lathes
Sanders
Boring Machines
Mortisers
Grinders
Glue Heaters

A new catalog of "Oliver" Electric Woodworking Machinery is now being printed. Ask for copy.

Oliver Machinery Co.

1018 Clancy Ave., N.

Grand Rapids, Michigan, U. S. A.



Combination Univ. Saw Bench and 6" Jointer

Union Portable and Bench Machines

Complete with individual motor and switch to start and stop are ideal Manual Training School equipment.

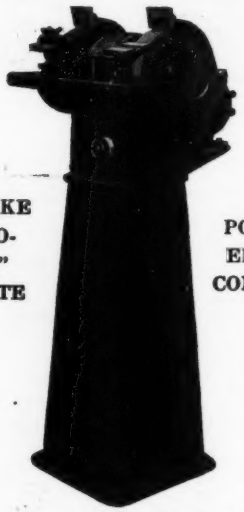
Safety provisions taken care of to the limit.
Any lighting circuit your power supply line.

Send for Bulletin Describing Union

6" Jointer Universal Saw Bench 16" Band Saw
4" Jointer Plain Saw Bench Shaper
Combination Universal Saw and 6" Jointer

GALLMEYER & LIVINGSTON COMPANY
388 Straight Ave., S. W. GRAND RAPIDS, MICH.

EFFICIENCY GRINDER



"BUILT LIKE AN AUTO-MOBILE" UP-TO-DATE

POWERFUL
EFFICIENT
CONVENIENT

A modern slow speed oilstone grinder—ideal for school shops. Independent rests and gauges make for correct grinding angles.

Any ten year old boy can grind tools correctly on this machine.

At our prices you cannot afford to be without this machine.

EFFICIENCY GRINDER COMPANY
326 WEST WASHINGTON AVE.
MADISON, WISCONSIN

JOHNSON DIRECT JET Gas Appliances

Assure the Best Results
Soldering, Heat-Treating and Metal Melting

No. 8 Adj. Torch

The No. 8 Torch has a 25 lb. capacity melting pot for any soft metal. The Pot can be removed and Torch used for heating soldering coppers or preheating of any kind. The burner is adjustable or can be removed entirely from the stand and used as a hand torch.

The Blast Furnace Without A Blower.

This Combination Bench Furnace will handle the largest soldering irons, heat-treat any carbon steel tools or melt 25 lbs. of soft metal. Fitted with three Powerful Johnson Burners, which do not require any forced air blast or blower.

No. 118 Bench Furnace

Send for our complete catalog of Gas Appliances.

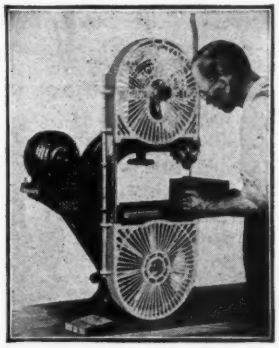
JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative:
C. B. Babcock Co. San Francisco, Calif.

No Limits
Steel — Wood — Soft Metals

The demand on a saw in Industrial Training work is severe because of the wide variety of materials handled. This unusual demand can be fully cared for by installing a

RACINE DUPLEX BAND SAW



This scientifically designed machine has speeds suitable for cutting wood, soft metal or steel. Ball bearing mounted vibrationless wheels add to the life of the saw; a spring tension makes it fool-proof.

Let us give you a demonstration. No obligation, of course.

Use "Racine" H. S. Wood and Metal Band Saw Blades and "Racine" H. S. Tungsten Power and Hand Hack Saw Blades.

RACINE TOOL & MACHINE CO.
1403 JONES AVE.
Racine, Wisconsin, U. S. A.

Manufacturers of the Famous Racine H. S. Metal Cutting Machines.

"STANDARD THE WORLD OVER"

No. 1052

—a new Millers Falls Brace that takes large size bit shanks

We made it expressly for carpenters and mechanics whose work requires the use of expansive bits and other bits with large size shanks.

The chuck is very strong and heavily knurled, to afford a good firm grip. The jaws are of the interlocking type, self centering, forged from steel and spring tempered.

A fine tool to learn with — a fine tool to keep on using for years to come. Apprentices and experts alike enjoy handling it. Special attention given to inquiries from vocational schools and manual training shops. Write for literature and prices.

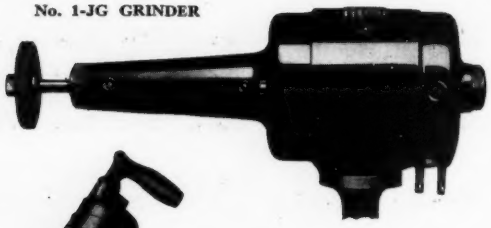
Cocobola head and handles
Exposed metal parts polished and nickel plated
Chuck with interlocking jaws, for large bit shanks
Ratchet—boxed
Head—ball bearing—full steel clad
Handle—inserted metal rings
Sweep—10 inches

MILLERS FALLS COMPANY
Millers Falls, Mass.
Manufacturers of Carpenters' Tools, Hack Saws and Automobile Tools

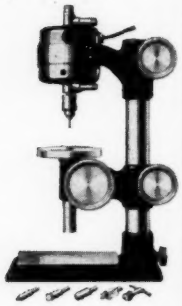
MILLERS FALLS TOOLS
SINCE 1868

Millers Falls Brace No. 1052
Interlocking Jaws—steel forged and spring tempered.

No. 1-JG GRINDER



Model
1-BD DRILL



PRECISION DRILL

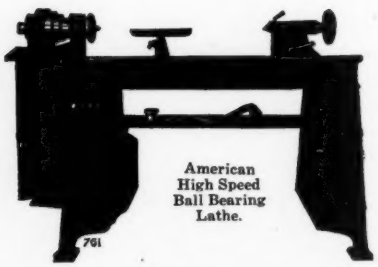
BUILT TO ENDURE

WE don't recommend abusing tools—but the tools we build will stand abuse. Pictured here are three DUMORE products that will perform satisfactorily under the guidance of even the most inexpert student. Equipping your workroom with any one or all of these sturdy, full-size tools means a permanent, trouble-free solution of all your grinding and drilling problems.

If you are not already equipped with high-speed portable grinders and motor driven drills—or if you plan to change from the type you are now using, we have some real facts to tell you about the qualities that make DUMORE tools so desirable for trade-school use.

Wisconsin Electric Company
6464 16th St., Racine, Wis.

Careless Fingers!!



Even the slap-dash, careless fingered student is unusually safe when operating the AMERICAN HIGH-SPEED BALL BEARING LATHE. The motor, drive pulleys and belt are inclosed. All hand shifting is eliminated by a sure one handle belt control and shifting device. Quick-acting emergency brake on head stock. SAFETY is really "first" and simplicity of operation combined with ruggedness under exacting strains a close "second" in the design of this splendid machine. It is your duty to know more about it. Write us today for complete specifications.

The same service standards are found in AMERICAN saw benches, jointers, planers, band saws and wood-workers.

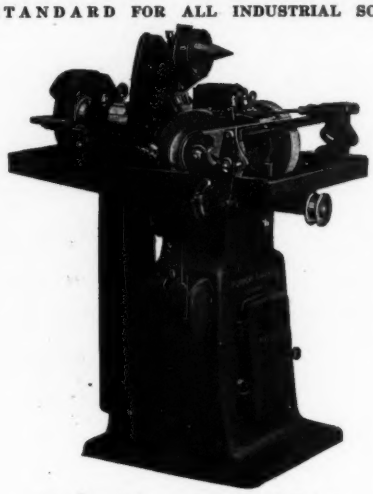
American Saw Mill Machinery Company
74 Main St. Hackettstown, N. J.

AMERICAN
MANUAL TRAINING EQUIPMENT

MUMMERT-DIXON OILSTONE GRINDERS

The Modern Edge Tool Sharpening Machines

THE STANDARD FOR ALL INDUSTRIAL SCHOOLS



No. 481—Motor or Countershaft Drive.

An automatic attachment for grinding long knives can be furnished with this machine.

THE FIVE LEADING FEATURES

1. Coarse Oilstone Wheel
2. Fine Oilstone Wheel
3. Grinding Cone
4. Leather Wheel
5. Emery Wheel

ALL AT YOUR FINGERS' ENDS

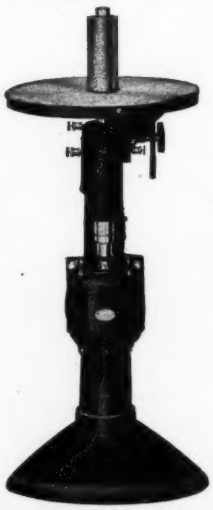
Send for full descriptive bulletin

MUMMERT-DIXON CO.
Hanover, Pa.

TYPE S-1 SYRACUSE OSCILLATING SPINDLE SANDER

Combined Oscillating and Non-Oscillating

Portable



Motor Driven

Used for internal and irregular work in pattern shops and furniture factories. Oscillating movement can be stopped by simply turning lever. Equipped with ball bearings throughout including motor. Table tilts 45° down, 15° up.

Write for Catalogue.

THE PORTER CABLE MACHINE CO.
1702 Salina St.
Syracuse, N. Y.

Helping Students to Become Masters

Ask the boy at the bench what his ambition is, and he will invariably confess that he wants to become a master at his work. Just ordinary proficiency won't put him in a class by himself. He knows that mastership is the only degree worth having.

And one of the first steps to that end is the mastery of his machine. It must be so designed and constructed that its operation will be a perpetual inspiration to him.

Sidney-Built
All-Geared Head Engine Lathes

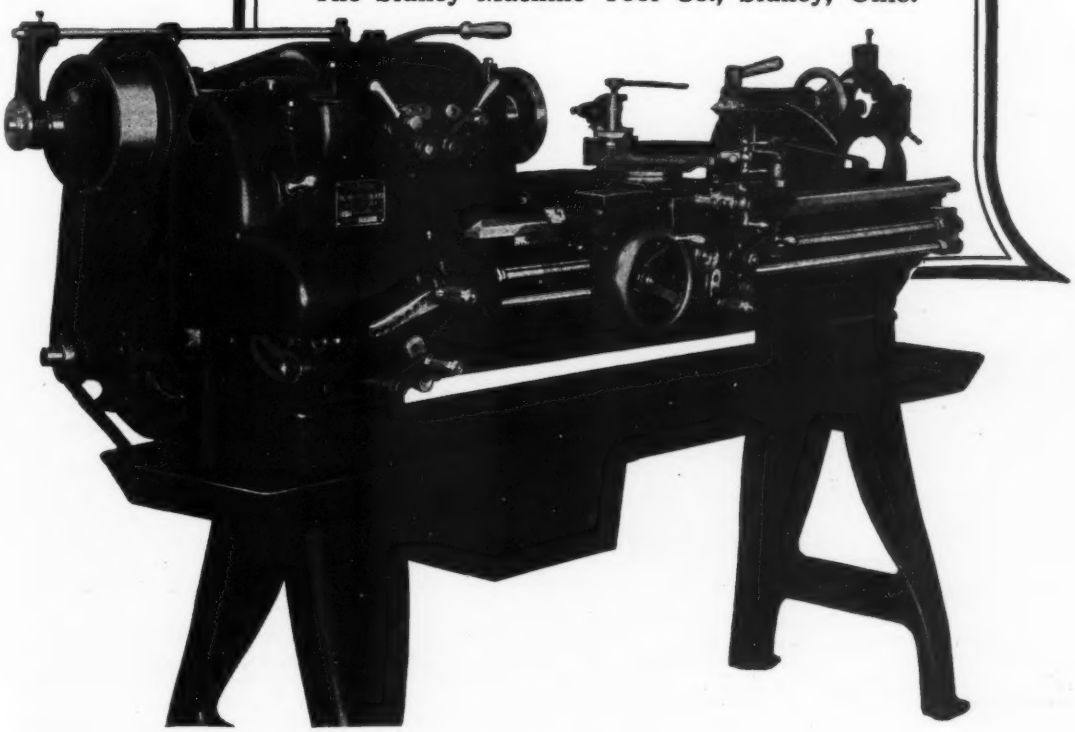
—are particularly adapted for use in vocational schools. The individual motor drive precludes the use of overhead countershafts and makes independent operation possible on a very economical basis.

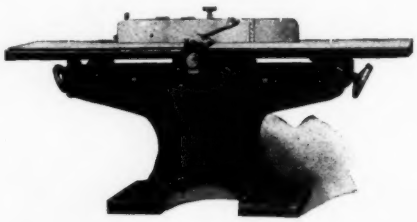
Then there are the shifting levers within easy reach of the operator, permitting quick and easy changes when lathe is in use. Specially designed clutches make possible a maximum of driving power while heat-treated gears practically eliminate the possibility of breaking.

A Special Bulletin has been prepared which gives complete information on Sidney-Built Lathes, a copy of which will be sent free on request. Also, our Engineering Dept. will gladly render valuable assistance in designing, laying out, and equipping Vocational training Departments, entirely without charge or obligation. Write us today for further particulars. Address Dept. 411.

The Sidney Machine Tool Co., Sidney, Ohio.

Below is shown our 12"x5' Standard Pattern All-Geared Head Engine Lathe, with 8-speed Headstock, showing arrangement of motor drive with motor mounted on rear of bed.





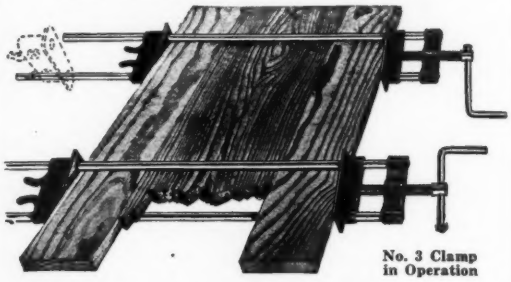
CRESCENT WOOD WORKING MACHINES are durable, dependable, reliable. You should make it possible for your students to become familiar with CRESCENT quality.

Send today for catalog of band saws, saw tables, jointers, borers, disk grinders, planers, planers and matchers, swing saws, cut off tables, shapers, mortisers, variety wood workers, universal wood workers.

The Crescent Machine Co.
25 Main Street,
Leetonia, Ohio, U. S. A.

HARTORD DOUBLE BAR CLAMPS

are a decided aid in class work since they eliminate the possibility of buckling. Better results are accomplished when the danger of spoiling the work is minimized. The bar on each side of the wood maintains uniform pressure.



No. 3 Clamp in Operation

HARTFORD No. 6 Double Bar Clamps are also used extensively as presses—for veneering, gluing posts, chair arms, etc. The cost, however, is much less and the saving worth your consideration. Your first order will be followed by others.

Send for Catalog No. 10, which contains complete price list on single and double bar clamps, hand screws and "C" Clamps.

HARTFORD CLAMP CO.
308 Pearl St. Hartford, Conn.

STRENGTH

SHELDON WORK BENCHES

will be of first importance in placing the industrial department of your school in the first rank. They have established a recognized standard for quality and design.

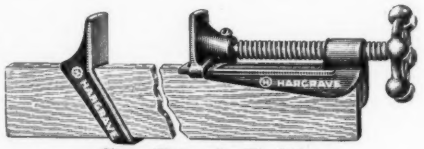
E. H. SHELDON & CO.
Muskegon, Michigan
(Send for catalogue)

MANUFACTURERS OF FURNITURE FOR

Manual Training	Art	Mechanical Drawing
Cooking	Physics	Sewing
Chemistry	Agriculture	Biology
General Science		Commercial

Standard Carriage Clamp—Sizes 2½" to 12"

Perfection Steel Bar Clamp—Sizes 2' to 10'



Clamp Fixture for Wood Bar

We manufacture a complete and up-to-date line of Clamps, ranging in size from 1 in. to 10 ft. opening, also many other improved mechanics' tools which should interest you. Write for our new catalog.

Ask your dealer for HARGRAVE QUALITY TOOLS

THE CINCINNATI TOOL CO.
Established 1879 Waverley Ave. and C. L. & N. Ry.
Incorporated 1884 CINCINNATI, OHIO

YOU NEED A HUTHER DADO HEAD

The saw that makes intricate cutting and grooving simple

This saw, developed from our own patents, consists of two outside cutters and a sufficient quantity of inside ones to perform the required cut. The outside cutters can be used singly or in pairs as required.

Every builder or contractor, wishing lock corners or any sort of grooving, will find his production costs lowered by this saw.

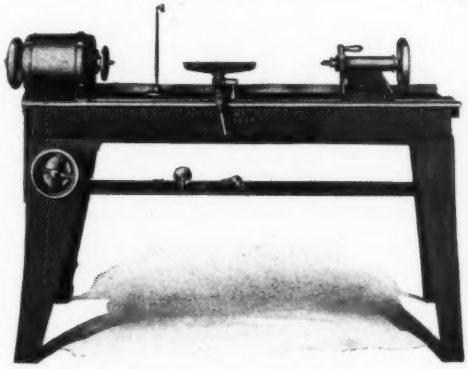
Write for complete information and prices, or send for one on approval. It may be returned at our expense if unsatisfactory.

HUTHER BROS. SAW MFG. CO.
Rochester, N. Y.

Established 1847 — Incorporated 1878

SMITH OF SMITHVILLE

Woodworking Machinery



No. 483-B MULTI-SPEED MOTOR HEAD VOCATIONAL WOOD LATHE

Motor ½ H.P. with speeds 600, 1200, 1800 and 3600 RPM, regulated and controlled by Hand Wheel at the front end. The Motor is 60 cycle, 2 or 3 phase and any Voltage. Lathes 12" Swing and Various Lengths, Larger Lathes made on the same general plan.

For full particulars, address

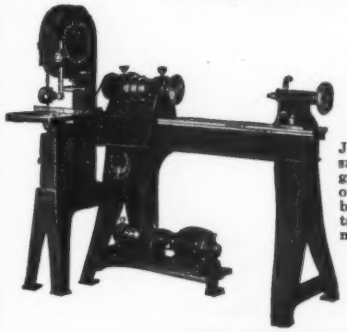
H. B. Smith Machine Co.

Smithville, N. J., U. S. A.
Or Nearest Branch
NEW YORK CHICAGO ATLANTA SAN FRANCISCO

LITTLE GIANT

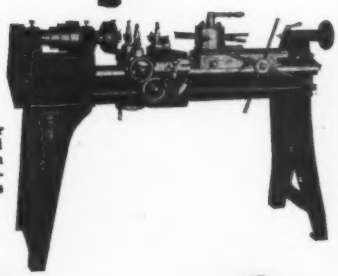
MANUAL TRAINING DEPARTMENT
SPECIAL EQUIPMENT

Head Stock Motor Lathe



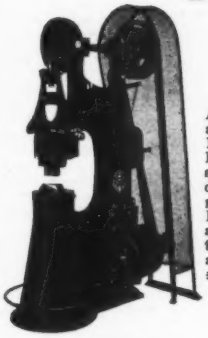
Combination Wood Lathe and Band Saw.

Jointer, planer, jig-saw, sander, buffer, grinder, mortiser and other equipment can be furnished and attached in a similar manner.



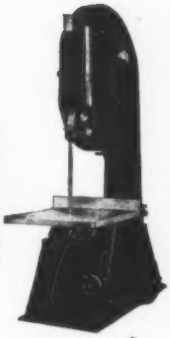
Metal Lathe—Motor or Belt Driven.

Miller, planer, gear cutter, grinder and other equipment can be furnished and attached the same as with wood lathe.



Power Hammer—Motor or Belt Driven.

All Little Giant Wood and Metal Working Equipment is sold on 30 days' trial, and guaranteed FOREVER against defective material and workmanship.



Band Saw—Motor or Belt Driven.

LITTLE GIANT COMPANY
Established 1876
223 Rock St. Mankato, Minn., U. S. A.

CLASSIFIED WANTS DEPARTMENT

The rate for classified advertisements is $.07 per word per insertion, payable in advance. All wants subject to approval. Minimum 25 words. Forms close on 5th of the month preceding date of issue. Write for discount on yearly insertions.

BASKETRY

Basketry Materials—We carry a complete line of basket making materials including Kindergarten reeds, all sizes, round and flat, in one pound packages. Our line includes raffia, French willows, straw braids, Hong Kong twisted grass, basket bases, rattans, chair cane, dyes, etc. The Jayson Company, Inc., 217 Mercer St., New York City.

Basketry Materials—We have everything for basket making, including reeds, willow, chair-cane, Indian splints, ash splints and wooden bases. Send Fifteen Cents for Samples, 65-page Catalogue and directions. This contains illustrations of over 500 baskets, trays, frames, etc., with suggestions as to making them. Lewis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

Everything for Elementary Handwork — Also for basketry, weaving, bookbinding and chair caning. Mounting boards, Waldcraft dyes, crayons, burlap, scissors, punch and eye sets. Thomas Charles Co., 2249 Calumet Ave., Chicago.

Basketry Material—Reed, Raffia, Bases, Pine Needles, Ash Splints, etc. Free Basketry Catalogues. J. L. Hammett Company, Cambridge, Mass.

BATIK

Manual Arts Supplies—Circular and straight knitters. Bookbinding Material, Bead Looms, Stencilling, Stick Printing and Batik Supplies, Wooden Napkin Rings, Plasticine, Flower Pot Moulds. Free Manual Arts Catalogues. J. L. Hammett Company, Cambridge, Mass.

BRUSH MAKING

Brush Making, the ideal subject for Special Schools and Manual Training work. Highly successful, wherever introduced. Send for 1924 illustrated pamphlet, listing various brushes of everyday use, with instructions how they are made. Magnus Brush Materials, 604 W. Lake St., Chicago.

CABINET HARDWARE

Cabinet Hardware and Upholstery Supplies for Manual Training. Latest period and mission pulls, costumer hooks, wood knobs, tea wagon wheels, electric cluster posts, cedar chest fittings, mirrors, wood dowels, Seng bed equipment. Complete line Stanley tools. Send for catalog. Ohio Vocational Supply Co., Wapakoneta, Ohio.

Special Service—We make it a rule to give special service on Cabinet Hardware for teachers. Send a postal today for our catalog. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

CANING

Finest Quality—We have cane, reed, webbing, flat rush, for all kinds of chair caning. Send Fifteen Cents for Samples, Directions and Catalogue. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

CATALOGUE.

Manual Training Supplies—Catalogue Number Four effective October 1st. Contains unusual items, i. e., Tea Wagon Wheels; Glued Chest Cedar; Bridge Fixtures; Panels; Oak Table Tops; Cluster Lamp Stands; Silk Lamp Cord; Wire Lamp Frames. Free to schools. National Manual Training Supply Company, 322 S. 4th St., Minneapolis, Minn.

Teachers of Manual Training Classes—Build a real airplane. Small cost. My blueprints mechanical and complete course in flying instructions make a practical work. Airplane supplies. C. E. Lay, Sta. O, Cincinnati, O.

CLOCKS

Clock Movements—chimes, dials, part of cases in the knock down, blue prints, designs, instructions, in fact, all assistance required by manual training teachers. Write for free booklet today. American Clock Company, Nicetown, Philadelphia, Pa.

We supply teachers with upholstered cushions for any piece of furniture and also all kinds of upholstering supplies. Write for price list. The Dodge-Dickinson Co., Bloomington, Ill.

DRAFTING

Catalog G.—New illustrated catalog on Drawing Stands and Drafting Tables. Suitable for Schools, Drawing Classes, Artists, Draftsmen and Engineers. The Washburn Shops of the Worcester Polytechnic Institute, Worcester, Mass.

"CYMA" Mechanical Drawing Instruments. "All-in-one" compasses, combining Lead, Pen and Divider Points—$1.25. Ruling Pen with Lead-Holder—$.60. The two items in Leatherette Pocket—$2.00. Exclusive features and quality make them best adapted for school work. E. Bourquin, 1353 Main Street, Waltham, Mass.

ELECTRICAL

Want Good Electrical Projects? Build PEPCO Hot Pads or Toasters. Neat, simple, rugged, economical, satisfactory. We furnish instructions and parts. Service if desired. Address "PEPCO," Highland Park, Illinois.

ENGINES

Engines—⅛ H. P. and up. Blueprints, Mechanical Books, Castings, Complete Engines, Gas, Gasoline and Steam, Small Boilers, Pumps and other Small Machinery. Send for catalogue, postpaid 20c (coin preferred) or stamps. Modern Engine & Supply Co., 334 Monadnock Block, Chicago, Ill.

FIBRE CORD

See our full page advertisement regarding our complete Art-Fibre Weaving Service. Art-Fibre Cord, Stakes, Furniture Frames, Finishes, etc. Write for our catalog of designs. Grand Rapids Fibre Cord Company, Grand Rapids, Michigan.

GLAZES

Judson T. Webb, formerly instructor in pottery at the Art Institute of Chicago, has located his laboratory and pottery supply business at 1710 W. 99th St., Chicago, Ill., Beverly Hills. He is prepared to furnish his glazes and colors, also clay, pottery tools and his potter's wheel. Send for new circulars. Judson T. Webb, 1710 W. 99th St., Chicago, Ill., Beverly Hills.

LOOMS

NEWCOMB Automatic, Fly-Shuttle, Hand Looms for Educational, Vocational and Commercial Purposes. Write for Catalog—Newcomb Loom Co., 474 Taylor St., Davenport, Iowa.

Looms—Adapted for schools, hospitals and college use. Eureka rug filling, carpet warp, basket reeds. Send for catalog with price. The Reed Mfg. Co., Springfield, Ohio.

LEATHER

Leather—We have a fine line of leather and imitation leather ready for immediate shipment. Write us your wants today. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

Leather for Bags, Cases, Pocketbooks, Fancy Leather Goods and Novelties. Wilder & Company, 226-228 W. Lake St., Chicago.

LETTERING

739 Teachers Wanted who can demonstrate the Ames Lettering Instrument to their students. Free blue print and circular. O. A. Olson Mfg. Co., Ames, Iowa.

LESSON PAPERS

Lesson Papers giving complete processes of newer crafts for teachers, professional workers and directors of occupational therapy. Send stamp for list. Bertha Morey, Ottumwa, Iowa.

MODELING CLAYS

Modelling Materials—Plasticine, never hardens, Antiseptic, Ten Colors. Send for free sample. J. L. Hammett Company, Cambridge, Mass.

PHONOGRAPHS

Build Your Phonograph. Quality phonoparts. Famous Serenado Motors. Quality Serenado motors and motors of other types. Electric Motors, tonearms, reproducers, amplifiers, case material, accessories. Free, blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Schools given special consideration and aid in phonograph construction. Catalog mailed for ten cents. Hoosier Manufacturing & Supply Co., 312 Baldwin Block, Indianapolis, Indiana.

Build a genuine Choraleon Phonograph and save one-half. We furnish motors, tonearms, blue prints, instructions and parts. Send for catalogue and free blue print offer. Also full line Radio supplies, Radio cabinets. Veneer stock. Choraleon Phonograph & Radio Co., 1123—20th St., Elkhart, Ind.

REED AND RAFFIA

Free Samples—We will send you free samples of all our reeds and raffia for school use. Catalog and directions, 15 cents. Louis Stoughton Drake, Inc., 33 Everett St., Allston, Boston 34, Mass.

Reed, Raffia and Chair Cane—Aviation quality, submarine prices. Reeds for kindergartens a specialty. Peter A. Wagner & Son, 1224-26 N. Marshall St., Philadelphia, Pa.

SEMI-PRECIOUS STONES

We are cutters of stones interesting to jewelry workers. Assortments gladly sent on approval. Reasonable prices. George H. Marcher, 934 Santee St., Dept. A, Los Angeles, Calif.

TAPESTRIES

We have a wide variety of Tapestries and Velours, in all sizes, styles and designs. It will be a pleasure to send samples. Write us your wants. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

TYPE

Wood Type, Metal Type, Printers' Supplies. Mfd. by Empire Type Foundry, Delevan, N. Y. (Est. 29 Years.) Ask for Catalog 17.

UPHOLSTERING

Samples—We will gladly send you Free Samples of our line of upholstering goods on receipt of inquiry. F. A. Rauch & Co., 410 S. Market St., Chicago, Ill. In one line of business for 41 years.

WEAVING

Weaving Supplies — Looms, Roving, Jute, Warp, Macreme, Belfast Cord, etc. Free Weaving Catalogues. J. L. Hammett Company, Cambridge, Mass.

WANTED

Wanted—Back numbers of the Industrial-Arts Magazine. Address: S. Lewis Land, Cookeville, Tennessee.

FOR SALE

For Sale—One Montgomery Ward 20" band saw, belt and counter pulley, $20.00. One W. F. & J. Barnes circular power saw, two 8" saws and drive belt. $20.00. Address M-7, Industrial-Arts Magazine, Milwaukee, Wis.

For Sale—Universal Woodworker, practically new. Has circle saw, jointer, band saw, mortiser and shaper attachments. Fifteen horse power A. C. Motor. Ideal for High School wood shop. Address M-8, Industrial-Arts Magazine, Milwaukee, Wis.

SIMONDS SAWS

Expert Mechanics and finest crucible steel make Simonds Saws the best that can be found. Whether it be Band, Circular or Hand Saws you require for the school shop, you will save money and get better results if you equip with Simonds.

Write for catalogue and prices

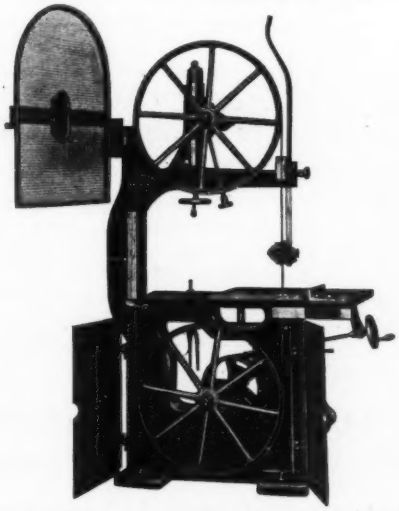
Simonds Saw and Steel Co.

"The Saw Makers"

Fitchburg, Mass.
5 Factories

Chicago, Ill.
12 Branches

NEW TYPE BANDSAWS



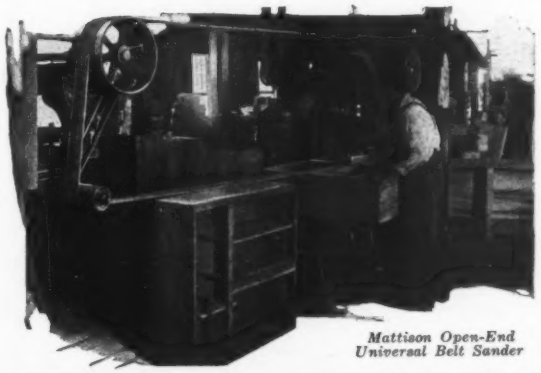
The New Model No. 185 and No. 186 Bandsaws represent the latest development in machines of this type. Built in two sizes, 30" and 36" wheels, with ball bearings or babbitted bearings, safety guards that are designed and built as a part of the machine, and can be furnished for belt or direct motor drive.

Write for literature describing these machines, also catalogue showing full line of wood working machinery for Manual Training Schools.

HALL & BROWN WOOD WORKING MACHINE CO.

Broadway, Tyler, Ninth Streets,
ST. LOUIS, U. S. A.

Sanding Assembled Cabinets With Hand-Block Sander



Mattison Open-End Universal Belt Sander

BESIDES providing a genuine machine method for sanding built-up cases, moulded shapes, etc., this Universal Belt Sander will give your boys an opportunity to familiarize themselves with mechanical sanding methods as they actually exist in practically every woodworking factory. If your school shop is not equipped with a Hand Block Belt Sander, you should immediately investigate this machine. We build three different models.

Bulletin 134 shows dozens of interesting operations. Ask for it.

MATTISON MACHINE WORKS

Rockford, Illinois, U. S. A.

CHICAGO GREENSBORO, N. C. NEW YORK SAN FRANCISCO

JOHN S. BENEDICT LUMBER CO.
419 No. Halsted St. CHICAGO
MANUAL TRAINING
L - U - M - B - E - R
We carry everything in our block of sheds, and can furnish anything you want. No order is too large or too small for us to fill.

LUMBER ?
Every woodworking project brings with it the questions of the kind of lumber to use, where to obtain it, suitability of different kinds of lumber, wood finishing problems, etc.
We invite our readers to write us on all questions relating to lumber, its uses, methods of finishing, etc. Answers are included in each issue under the department, "Now, are there any questions?"
The Lumber Dealers whose advertisements appear in the INDUSTRIAL-ARTS MAGAZINE are devoting special attention to school requirements and will be glad to give you detailed information on the kinds of lumber they handle and its uses.

Alexander Brothers
Belzoni, Mississippi
Band Mills: BELZONI, MISS. RED GUM, LA.
BRAND ABros.
Manufacturers of high grade pln. and qrtrd. Red Gum, White and Red Oak, Figured Delta Gum, Sap Gum, Soft-Texture Cypress, Cottonwood, Elm, Pecan, etc.
Inquiries solicited. Samples per request.

CHERRY LUMBER CO.
St. Bernard-Cincinnati, O.
Aristocratic
Walnut and Cherry
We can kiln dry, glue up, surface and sand. To make real furniture this is necessary. One piece or carload.

Aromatic Tenn. Red Cedar Boards—Small shipments a specialty. Write us for prices, delivered at your railroad station.
EARTHMAN LUMBER CO.
MURFREESBORO, TENN.

COMPLETE LUMBER SERVICE
Consult us regarding your requirements
"A Dozen Boards Or A Dozen Carloads"
JOHN SCHROEDER LUMBER CO.
MILWAUKEE, WIS.

Maisey & Dion
2349-2423 So. Loomis St.
CHICAGO, ILL.
Why not save TIME and TROUBLE? Deal with a concern that has SATISFACTORILY supplied the LEADING SCHOOLS with Manual Training Lumber for over FIFTEEN YEARS.

HAFNER MFG. CO.
ST. LOUIS, MO.
Immediate shipment of your order is but one feature of our service to you.
A large and varied assortment of Manual Arts lumber always on hand.

T. A. FOLEY
We Furnish Schools With
Lumber, Panels, Dowels and Cedar Chests
PARIS, ILLINOIS

VENEERED PANELS
Black Walnut, Mahogany, Quartered Oak, Plain Oak, Birch, Yellow Pine. ¼" and ⅛" thick, all sizes.
Send for price list.
Western Veneered Panel Co.
1732 Troost. Kansas City, Mo.

WhiteBrothers
Hardwood Headquarters of the Pacific Coast.
5th and Brannan Sts. San Francisco
Special attention given to Manual Training requirements.

IT NEVER MARIETTA WOOD AND METAL FINISH SPECIALISTS **DISAPPOINTS**
Marietta Spartanite Enamel is so elastic that it is adaptable to the widest range of climatic conditions. It will wear well either inside or outside and cannot be beaten for beauty.
Ask us for proof.
THE MARIETTA PAINT & COLOR CO.
General Office and Factory: MARIETTA, OHIO
Southern Office and Factory: HIGH POINT, N. C.
P. S. We also make stains and varnish.

Veneered BASKET Bases
IMMEDIATE SHIPMENT
PROPERLY BORED
SMOOTH TWO SIDES

ALSO
BOARDS
Drawing Peg Clay Modeling
Dowels Lumber Plywood
ENGLEWOOD TOP & PANEL COMPANY
CHICAGO 6316 Wentworth Ave. ILLINOIS

PEASE

Drafting Room Furniture

Everything for the Drafting Room

Tables, stools and filing cabinets in any style, any finish, any material and in any quantity direct from the factory to the school.

Durability and sturdiness are built right into Pease furniture. Drawers slide easily—joints won't warp. Finish is lustrous and put on to stay.

Send for a copy of our Furniture Catalog. It contains items of particular value for school use, including our special instructors' drawing tables.

The C. F. Pease Company
802 No. Franklin St.
Chicago, Ill.

WOOD STAINS

BUY THEM

in powdered form, water soluble, and learn the perfect satisfaction and economy that results from the use of QUALITY materials.

WE CAN SUPPLY a complete line of wood finishing materials for every need of your shop.

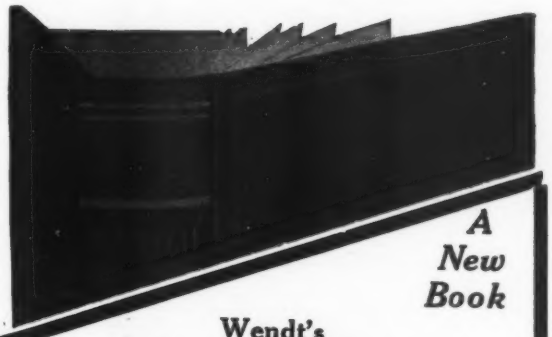
WE ALSO HAVE an interesting series of WOOD FINISHING BULLETINS which we are glad to mail to instructors on request.

MAY WE not hear from you today?

"Everything good for Finishing Wood"

GRAND RAPIDS WOOD FINISHING CO.
Grand Rapids, Michigan

A Well Known Elementary
Course in Foundry Work
is ready
in a
NEW McGRAW-HILL TEXT



A New Book

Wendt's

FOUNDRY WORK

198 pages, 172 illustrations
$2.00 net, postpaid

At Purdue University an elementary course in Foundry Work is given that is regarded as being one of the best courses of its kind in the country. As Head Instructor in Foundry Practice at Purdue, Mr. Wendt has had ample opportunity to develop the course to its present completeness and has now presented it in book form. It is well adapted to technical high school and vocational school courses.

Fundamental principles.
Sizes and types of blast furnaces.
The making of pig iron.
The book covers
Bench molding, floor molding.
Dry sand core-making.
The mixing and melting of metals.

Plenty of questions, exercises and problems are included.

See a copy. Use the coupon.

Free Examination Coupon

McGraw-Hill Book Co., Inc.
370 Seventh Ave., New York.

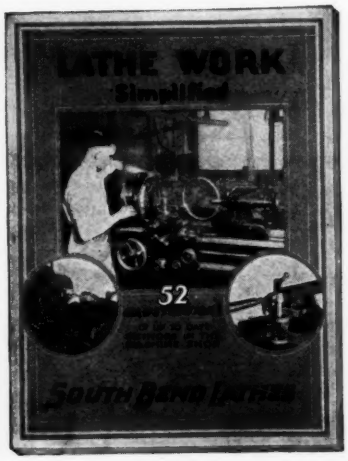
You may send me for 10 days' free examination:
Wendt's Foundry Work, $2.00

I agree to return the book if it is not adopted in my classes.

Name .....
Address .....
School .....
Official Position.....

Ind.-A. 11-1-1923

SOUTH BEND LATHES



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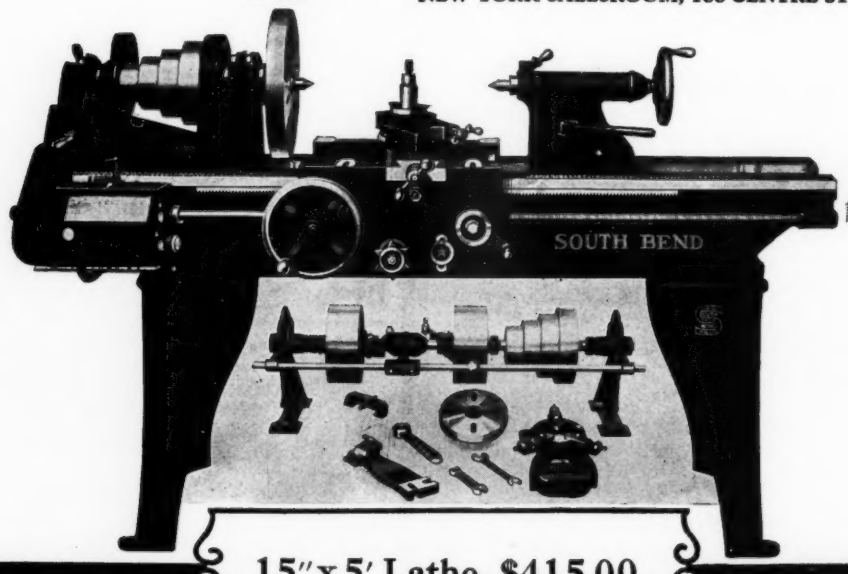

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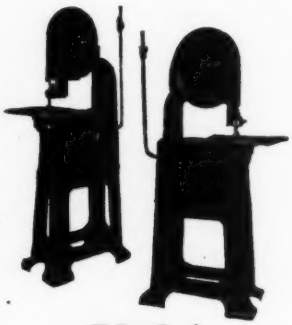

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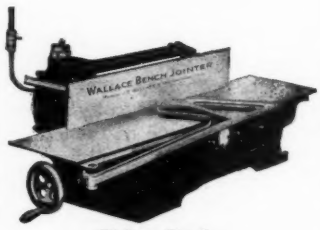

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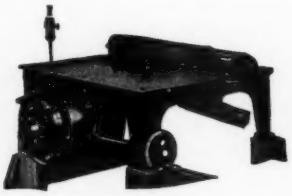

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INDUSTRIAL-ARTS MAGAZINE

Volume XII NOVEMBER, 1923 No. 11

A Comparison and Criticism of the Allen and Selvidge Methods of Teaching a Trade

Prof. D. J. MacDonald, Columbus, O.

A STUDY of educational literature shows many instances during the last five centuries where pronounced innovations in teaching, administrative or supervisory methods have been advocated and in many cases actually introduced. In fact, it is doubtful if any single generation, at least in the last two centuries, has not found it necessary, not merely once, but several times, to pass judgment upon the merits of this or that different, though not always new, method of teaching reading or some other equally vital subject, or it may be of administering to the needs of this or that group of pupils. I dare say that the majority of modern educators, especially those in administrative positions, are obliged to pass such judgment many times during each school year. But, strange as it may seem, the history of pedagogical procedure, at least so far as the writer is aware, records but few instances where such innovations in methods have had to do with the teaching of shop subjects. This may be due to any of the following causes:

(1) The recent introduction, comparatively speaking, of such subjects as a whole into our school curricula, whether public or private, or

(2) The state of unpreparedness, academically speaking, which has all too universally marked those in charge of such work in our schools, or

(3) The inherent nature of shop subjects, or, finally

(4) A combination of these.

I venture the opinion that all of these have had their influence. But be that as it may, the fact remains that for the first time in this generation,[1] if not in all time, we have the opportunity of passing judgment upon two methods of teaching a trade which, in many respects, are radically different in nature. And, since these two distinct methods of procedure have come to us at a time when trade education is progressing so rapidly under both public and private auspices, I have seen fit to venture a critical comparison and evaluation of them.

[1]I am not unaware, to be sure, of the Sloyd and other methods of teaching manual subjects. If these methods are looked upon as applying to the teaching of trades, as to be sure, they may be, then they stand as exceptions to the above statement.

It should be apparent to all that one is always more or less at a disadvantage when he attempts to set forth in detailed form the viewpoint of another. For, in the first place, the chances are about nine out of ten that the author of said point of view little expected, when formulating it, that it would be subjected to critical inspection. And in the second place—especially is this true where the details are numerous as in the present instance—the possibility is strong that the author would not care to indicate a definite and fixed sequence to be observed. On the contrary, he would doubtless take the position, and in my opinion he would be entirely justified in so doing, that a certain degree of interchangeability should obtain, especially with reference to some of the steps, dependent, of course, upon the nature of the job and accompanying conditions.

But—and this is of vital importance here for purposes of comparison and criticism—it was all but imperative that a definite order of procedure, a fixed sequence of steps, so to speak, be discovered and stated even though by so doing the authors of the respective methods might be dealt a degree of injustice and the writer correspondingly lay himself open to more or less just criticism.[2]

Chief Differences Between the Two Methods.

It will doubtless prove advantageous to point out the major differences and similarities which seem to obtain between the two methods before attempting to offer a criticism of either method as a whole or of phases of the same. Accordingly I shall endeavor to indicate briefly, first, the chief differences between the two methods. The similarities will be listed later.

(1) Though both obviously have the same objective, namely, that of teaching a student the things that will qualify him to do any job that falls within the scope of the trade, their methods at once diverge. A., it will be noted, starts off by listing all of the jobs in the trade, while S., who considers "the unit operation the unit of instruction," takes for his first step the

[2]In this instance the writer's acquaintance with and high regard for both authors gives him the courage to proceed without fear of serious charges being brought against him. It is worth recording that neither author was consulted regarding the content or the sequence of steps in his method.

THE TWO METHODS COMPARED.

The Allen Method.

I. Analyze trade by listing all jobs in the trade.
II. Classify what is to be taught:
(a) Types of jobs.
1. Trade or production:
a. Assembling.
b. Shaping.
c. Forming, etc.
2. Technical:
a. Drawing.
b. Problems of various sorts.
(b) Types of auxiliary material:
1. Trade terms.
2. Trade science.
3. Knowledge of stock.
4. Safety first.
5. Care of tools, etc.

III. Divide trade into units or blocks on basis of type or kind of learning difficulties involved therein, as
(a) Same kind of skill.
(b) Same kind of knowledge.
(c) Same kind or use of tools, etc.

IV. Determine through analysis of the various jobs the mathematics, science, drawing, etc., as well as the information regarding tools, trade terms, stock, safety precautions, etc., necessary in connection with each job.

V. Determine the progression factors for each unit or block, e.g.:
(a) Fear.
(b) Degree of accuracy required.
(c) Number and difficulties of operations.
(d) Speed necessary.

VI. Establish checking levels (difficulty scale), or a means of determining progress of student.

VII. Determine type job specifications or characteristics of the jobs that the learner can do at each checking level.

VIII. Determine the objectives for the various units or blocks, i.e., a statement of what the leaner can do and what he knows (or is expected to do and know) when the unit is completed.

IX. Determine similarly the objectives for each checking level of each unit or block.

X. Arrange jobs in proper instructional order.

XI. Prepare job instruction sheets containing for example:
(a) A clear statement of the objective.
(b) Sketches of the work at different stages of progress.
(c) A statement of the sequence of operations.
(d) A series of questions designed to bring out the why of things.

XII. Prepare skeleton (lesson) plan covering:
(a) Analysis of teaching unit into successive teaching points.
(b) The determination of the "jumping off place."
(c) An enumeration of the successive ideas to be used in leading up to the "jumping off place."

XIII. Prepare detailed operation sheet (lesson plan) indicating details as to how each step is to be carried out, e.g.:
(a) Specific objective.
(b) Exact statement of material, in the way of tools, equipment, stock, etc., needed.
(c) Sketches of diagrams, illustrations, etc., to be used.
(d) Exact questions that will be asked.
(e) Method of approach, presentation, and application to be employed.
(f) Method of checking up or testing to be used.

XIV. Assign jobs or problems to students in accordance with the student's estimated state of preparedness.

XV. Place job instruction sheet in student's hands and instruct him to proceed with job.

XVI. If necessary, show student how to perform any specific operation or part of operation involved in the job.

XVII. Provide information either directly or indirectly when it is essential to student's progress.

The Selvidge Method.

I. Analyze trade by:
(a) Listing the various unit operations.
(b) Listing the topics of information.
(c) Listing the various problems.

II. Place trade analysis in the student's hands.

III. Explain phases of trade analysis to student, if necessary.

IV. Carefully analyze a number of simple jobs.[1]
(a) By checking on trade analysis sheet the operations involved in each job.
(b) By listing the operations involved in the order in which they occur in the jobs.

V. Assign student simple job for him to analyze by means of checking on trade analysis sheet the operations involved in doing the assigned job.

VI. Check over student's analysis and question student, if necessary, regarding how certain things (operations) are done until desired analysis is brought out.

VII. Have students analyze simple jobs until he knows how to use the analysis sheet.

VIII. Have student list the operations of the jobs analyzed in the order in which they occur in doing the job.

IX. Check student's analysis and question him regarding same, if necessary.

X. Assign student specific job to perform.[1]

XI. Give student definite instructions (drawing, illustrations, directions, etc.) regarding each step to be taken in performing the different operations in the job.

XII. Give student outline of information (trade terms, etc.) necessary to a proper understanding of the job to be performed.

XIII. See that student reads the directions and the information outline carefully before he begins to work.

XIV. Require student to repeat and explain the instructions until certain that he understands every detail.

XV. Assign references upon how to perform the different operations.

XVI. If necessary, demonstrate any new operations involved.

XVII. Insist that student work in accordance with the plan (operation sheet).

XVIII. Prepare and give to student a list of questions which deal with why the operations are performed in the way they are.

XIX. Check the student's work.

XX. Require report from student on
(a) Time and material consumed.
(b) Special difficulties met and how they were overcome.
(c) Possible ways of improving the plans (operation sheet).

---

[1]The author states specifically on P. 103, "How to Teach a Trade" that "the teacher should never assign a job until he has analyzed it."

listing of the various unit operations in the trade. The significance of this first difference cannot well be over-emphasized since upon it depends many of the later details.

(2) A., is apparently much more concerned than S., about getting the student tied up to the job or jobs most appropriate for him at particular stages in his trade career, consequently his greater emphasis of

analysis and classification of subject-matter as he views it.

(3) S., on the other hand, is apparently desirous of placing greater responsibilities upon his students and to do it at a much earlier stage of the game.

(4) While both believe in giving their students statements which indicate the specific sequence of what is to be done, it will be noted that A., limits himself to a statement of the sequence of operations involved in the job, while S., gives the student, first, the trade analysis sheet through the use of which he is expected to perform the job analysis; second, the sheet containing definite instructions regarding each step that is to be taken in performing the different operations in the job; and, third, references upon how to perform the different operations.[3]

Outstanding Similarities in the Methods.

There is obvious agreement upon the following:

(1) That the various important items of information regarding the trade shall be carefully cataloged and as carefully presented in one or another form at the proper time.

(2) That the demonstration shall be resorted to when progress would otherwise be delayed.

(3) That questions designed to bring out the *why* of operations shall be prepared and placed in the student's hands.

Critical Discussion.

Any student of pedagogy who examines these different ways of teaching will soon conclude that practically all of the differences as to details of method are inevitable outcomes of the fundamental disagreement as to what should constitute the starting point. Thus, if the job is to constitute the basic unit of instruction, then naturally enough later procedure shall be built around it, while if the operation is to be considered the basic unit, then the teaching structure will have to be erected upon that foundation. It must be, therefore, that here we have a very vital point: Which is the more pedagogically sound basis for effective trade teaching, the job or the unit operation? Before we are prepared to draw any conclusions one way or the other, it will be necessary to examine these cases somewhat carefully and ascertain, if possible, just what each author has in mind. A., would doubtless subscribe to the following statement: that "a trade analysis contains a list of all of the jobs a man must be able to do and all the knowledge a man must have in order to become a skilled workman in the trade." Therefore, so far as the term "job" is concerned, it would seem that it has reference to that large variety of experiences which enter into the daily life of any craftsman, namely, the succession of physical or mental activities, or both, involved in carrying through any unit piece of work that is popularly referred to as a job. Apparently time does not enter as a determining factor, for some jobs are such as to permit their completion within the space of a few seconds, while others may require several hours or even days. It is doubtless unnecessary to point out that the job of short rather than long duration is the one most frequently found, that a job may be exceedingly simple or very complex, and finally, that it may be predominantly either physical or mental in nature.[4]

One other characteristic should also be noted, namely, that the sort of job one has in mind when he is thinking about teaching a trade, is, in 99 cases out of a hundred, a piece of work that is performed by the man on the machine, the craftsman, if you please, however good or poor he may be, and not by the foreman or other superiors.

The following will serve as good illustrations of what A., means by the term, job:

(1) Cutting studs for a house,

(2) Cutting and placing foundation posts,

(3) Filing a cross-cut saw,

(4) Laying out and placing stringers for porch steps.

These he would call production jobs, as contrasted with technical jobs, which involve the use of technical information and do not consist primarily of muscular movement.[5] I conclude this phase of the discussion and open the consideration of what a unit operation is by quoting from S., who claims that "very few trades can be analyzed on the basis of *jobs*." "Even if it were possible to do so," he says, "it would be necessary to analyze each job into the processes involved in doing it, in order to teach the job."[6] On the same page a unit operation is defined as one "which requires some degree of skill in its performance, occurs with more or less frequency in the practice of the trade and involves practically the same steps in its performance wherever it is found. Any group of steps occurring frequently, as a group, in the work of any trade may be regarded as a unit operation. All jobs are made up of one or more of these operations.[7] The following are given as illustrations of unit operations in the plumber's trade:

(1) Making plan and layout sketch.

(2) Laying tile sewers.

(3) Threading pipe.

(4) Reaming pipe.

(5) Caulking joints.

(6) Wiping joints, etc.

As has already been pointed out the relative merits of the two methods depend primarily upon whether *the job* is a better or poorer basis for a method of teaching

[3] It should be recorded also that S., favors preliminary practice on the more difficult operations until the student is ready to attempt an actual job involving such operations. See "How to Teach a Trade," Selvidge. P. 38.

[4] See "The Instructor, The Man and The Job," Allen. Chapter VII.

[5] I hope that I have correctly interpreted A., in the above, though, as a matter of fact I am not at all sure about it after reading on P. 47 of his "The Instructor, The Man and The Job" that "the term 'job' means anything that a man is paid to do." It should be recorded at this point that no little confusion has resulted from the loose definition of this term on the part of laymen as well as on the part of the great majority of industrial teachers. Personally I believe it is better to think of a job as being more or less analogous to a project, though I am well aware that in suggesting this I am not in agreement with the definition which has been the outgrowth of the scientific management movement.

[6] "How to Teach a Trade," Selvidge. P. 25.

[7] Op. cit. P. 28.

than *the unit operation,* though it is easily conceivable that defective procedure in developing the method after the basis has been selected might play a very important part. It seems necessary, therefore, to attempt at this point an evaluation of these two points of departure and their implications.

It must be granted at the outset that despite any statements to the contrary, both bases for trade analysis, namely, analysis on the basis of jobs and analysis on the basis of unit operations, are possible. If there is a question, therefore, regarding either, it must concern itself with the desirability rather than the possibility of such bases. In order that a more exact comparison may be made possible, the major steps in each method in greatly abridged form are placed in parallel columns.

COMPARISON OF THE METHODS.

Job Method.	Unit Instruction Method.
Rough layout and classfication of course of study:	Rough lay out of course of study consisting of:
(a) Types of jobs in trade.	(a) List of unit operations in trade.
(b) Types of trade information.	(b) List of trade information topics.
	(c) List of trade problems.
Determination of units or blocks on the basis of learning difficulties involved.	Placing of trade analysis sheet in student's hands and interpreting same to him if necessary.
Determination of progression factors for each unit or block.	Giving student simple job to analyze through the use of the trade analysis sheet.
Establishment of checking levels (difficulty scale).	Assisting, if necessary, and keeping student analyzing until he understands how to use the analysis sheet.
Determination of type job specifications for different levels.	Assignment of specific job to student.
Arrangement of jobs in proper instructional order.	Giving student specific (written) instructions regarding how to perform the different operations in the job; also outline of trade information relating to the job.
Preparation of job instruction sheets for student's use.	Requiring student to read and explain instruction sheet.
Preparation of lesson plans for teacher's use.	Provision of such assistance as is necessary.
Assignment of appropriate jobs to students and handing out job instruction sheet.	Giving student list of why questions.
Provision of such assistance as is necessary.	
Checking up on student.	

Broadly speaking, the criteria for judging any method of teaching, whether it be in written or acted form, should fall under four headings, namely:

(1) The suitability of objectives chosen.
(2) The appropriateness of subject-matter selected.
(3) The suitability of method employed.
(4) The degree to which the objective is realized.

Obviously, it is quite impossible to say anything relative to the last mentioned. And since mention has already been made of the objectives in the two cases apparently being the same, this need not be referred to at further length. Moreover, so far as this discussion is concerned, number two may likewise be left out of consideration, since in all probability both men by actual test would be found to avail themselves of approximately the same subject-matter in teaching any specific trade. That is to say, they would use jobs involving the various trade operations, the necessary trade information, etc., essential to the development of all-round craftsmanship in those who take the work. But here is the crux of the matter: They would approach and carry through the teaching act, so far as it relates to the organization and presentation of subject-matter in two distinctly different ways. Our task, therefore, becomes one of evaluating the worth of two methods of accomplishing the same result when similar material—in this case subject-matter and students—is being dealt with.

Any evaluation of method proper, when that method is in printed form only, must necessarily concern itself with the apparent effectiveness of said method for getting and keeping learners in such a frame of mind that they will not only strive to reach but will make appreciable progress towards a definitely established goal, which goal is difficult, yet possible, to attain. (Those familiar with pedagogical literature will readily recognize that this is but another way of saying that the teacher must so graduate the problems or tasks that they correspond with or are commensurate to the increasing ability of the learner to cope with them.) The application of this measuring stick to the two methods constitutes our immediate task.

It does not require an expert to see that whatever defects the job, method, as set forth, may have, it rates high when the measuring stick of graduating tasks so that they accord with the student's increasing ability is applied. The fact is, six of the eleven points listed above have clearly to do with selection and classification of material for teaching purposes. It is possible, to be sure, that the wrong jobs may be selected but, as already pointed out, a consideration of this must of necessity fall outside the scope of this treatment. To substantiate the above judgment, it is necessary only to refer the reader to steps three, five, seven, eight, nine, and ten in the detailed setting forth of A's method. Surely these unmistakably indicate most painstaking and thorough steps in the desired direction.

If we now attempt to apply the measuring stick to the other method, we cannot help seeing at once how strikingly it differs in the respect referred to. Note, for instance, the utter absence of any evidence which indicates appreciation of the importance of what are called progression factors in A's method, namely, fear, degree of accuracy, etc., which, it must be admitted, play important roles in the would-be mechanic's career. Note second, what might be interpreted as the absence

of any attempt to classify jobs on the basis of the type of learning difficulty involved therein. In one instance, as a matter of fact, S., unquestionably indicates his disapproval of the principle just enunciated,[8] while, in another instance, he advises that it be followed as far as possible.[9] It is doubtless fair to the author to say that he recognizes the importance of the principle but finds its application difficult in connection with the unit operation basis of trade analysis.

Yet another aspect of the question deserves consideration. I refer to the first step, following that of trade analysis in S's method, namely, that of placing sheets in the hands of his students and requiring them to analyze and plan the jobs. There is no other place in this entire method, in my opinion, where it so merits adverse criticism as at this point. It is all very well to say that the student should "become familiar with the unit operations," that "he must know something of what is involved in the trade," that "he must have a clear idea of what is involved in each operation," etc.,[10] but to maintain that "he will have no difficulty in getting this information if he turns to the operation sheet and reads it," is, to say the least, stretching the point considerably. Moreover, support for this expressed doubt seems to be provided in the author's own statements that "students are sometimes unable to understand the instructions," and that "this may be due to the student's inability to get information from the printed page."[11]

I have no desire to quibble over unimportant matters or to indulge in any hair splittings. Life is far too short and too full of worth-while things for such indulgence. I merely wish to emphasize what I conceive to be a significant defect in the details of a method that will inevitably become widely employed in our public schools,[12] a method in which, by the way, I find many excellent things.

Inability to get the meaning of the printed page has long been recognized as one of the chief deterrents to school progress in all pupils but especially so, if reports are reliable, among part-time pupils. Moreover, teachers of high school science quite generally offer similar testimony. The truth of the matter is, despite their elementary training, practically all young persons experience extreme difficulty in getting the exact meaning of printed matter, particularly if such printed matter consists of detailed instructions or directions. It is because of this well-known fact and of the equally imporant one that a working knowledge of any line of activity where skill plays an important role cannot be acquired by any other means than by active participation in that line of activity, that I find it so difficult to approve of this phase of S's method. When the author says that "The man who can examine a job and see just what there is to do and can outline the order of procedure in doing it, has learned a most important part of a trade," and that "In order to do this he must *know* (the italics are mine) the operations of the trade and have a pretty clear idea of how they are performed,[13] I am in thorough agreement with him, provided, of course, I interpret him correctly. Likewise do I agree, when he says that before the student can analyze a job satisfactorily, he "must have a clear idea of what is involved in each operation."[14] But we part company when he insists that "the student will have no difficulty in getting this information if he turns to the operation sheet and reads it.[15] For regardless of how carefully such instructions are prepared it is impossible, in my opinion, to "describe each step so simply and so clearly that anyone who can read can understand."[16] I am utterly unable to see how the person who has had no contact with the trade can read instructions regarding that trade understandingly.

Notwithstanding my strong objection to this phase of S's method, I am in thorough agreement with him regarding certain other important details. In fact, I firmly believe that what I have pointed out as a highly undesirable method of dealing with novices would at the same time prove to be a superior method of dealing with persons who have had limited but real contact with the trade. For, unquestionably the author is correct in his assertion that every effort should be made to help the student develop self-reliance. That the practice of placing a trade analysis sheet in the student's hands and asking him to do his best toward analyzing and planning an assigned job would tend to promote the development of self-reliance, goes without saying. For students who are well into or have passed the novice stage I, therefore, consider the unit operation method a decided improvement over the job method. There is not the slightest doubt but that one of the outstanding defects in the teaching of shop subjects as a whole is the failure to devise and employ a method whereby the student slowly but surely approaches the goal where he can get along without further aid. By all means, then, let us extend a welcome to a method which not only makes possible the development of self-directive ability in students, but positively assures such development in those who persist.

A thing I fully endorse in both methods is the detailing of necessary information in connection with each job and the implied, if not stated, suggestion that such

[8] "It is not possible to list the jobs of a trade in the order of their difficulty but a teacher can readily determine whether the operations involved are too difficult for a given individual." Op. cit. P. 106. It is difficult to understand just what is meant here. For, if the job is made up of operations, information, scientific facts, etc., as is stated on P. 22, and if, as is quoted above, the teachers can readily determine whether the operations involved are too difficult, etc., then is this not virtually admitting the possibility of classification?

[9] Op. cit. P. 106. "The teacher should assign jobs which he believes to be within the capacity of the student."

[10] Op. cit. P. 92.

[11] Op. cit. P. 74. The natural presumption is that the author has in mind the names of these operations rather than the operations per se; but note how he later corrects this impression.

[12] In view of the fact that the author repeatedly makes use of the term, "man," when discussing his method, I have had a feeling at times that his thinking is largely in terms of adults rather than of young persons 14 to 18 years of age. But since trades are taught to the latter as well as the former and since, too, no statement to the contrary is found, I have had to conclude that the method is intended to meet the needs of all.

[13] Op. cit. P. 73.

[14] Op. cit. P. 75.

[15] Op. cit. P. 75.

[16] Op. cit. P. 42.

information be made available to the learner at the appropriate time, i. e., immediately preceding or simultaneously with the job.

If the trade information outline which is given to learners (not novices) in S's method is what I interpret it to be, I again must accord it superiority over the other method. For S., is quite right, at least so far as the vast majority of young mechanics are concerned, when he says: "There is no particular development in acquiring facts. The development comes through using them. It is far better, therefore, to give the necessary facts and let the student spend his time in finding out how to use them."[17] If the full significance of this important fact were appreciated by the rank and file of shop teachers it is safe to say that a much larger percentage of those who leave our schools and enter industry would give better service because of the fact that they have not had inculcated in them an entirely wrong attitude toward work.

The assignment of questions which deal with *why* operations are performed as they are, is an excellent feature of both methods and should be practiced far more than it is in all school shops. I am not exaggerating in the least when I say that not one shop teacher in ten today has even gone to the trouble to formulate such questions regarding the various jobs or projects, let alone using them.

One of the details in the unit operation method that will doubtless unfavorably impress the majority of teachers in the industrial education field is the use of exercises.[18] It goes without saying that such exercises are to be looked upon as preliminary instruction and should be discontinued as soon as it is felt that the learner can pass to a practical job with confidence and reasonable assurance of success. The fact that it is inconceivable how the unit operation method could be successfully employed without resorting to the use of exercises in the manner described is nothing at all against the method. For, if the whole truth were told, *a limited amount of exercise work is advisable in connection with all shop classes.*

The provision requiring students to report upon material consumed, special difficulties met, etc., is also an excellent feature of S's method. The contribution toward all-round efficiency which might be made through this need not be insignificant by any means. Above everything else it would tend to assure completion of the task, a thorough rounding out of things, by reason of careful reflection upon them. The attitude of mind that would be encouraged thereby, needless to say, is altogether too rare. It is possible that similar provision is made in A's method, but if so, I have failed to locate it.

The careful reader has, of course, already noted the marked difference between the two methods with respect to lesson planning. The question which naturally presents itself is whether this marked difference is inevitable. Is there, in other words, no place for A's elaborate scheme of lesson planning in S's method which, it will be recalled, endeavors to get results from the student at once by placing the trade analysis or list of unit operations in his hands? Then, too, it will be recalled that at the proper time S., also requires the student to analyze simple jobs through the use of the unit operation sheet before he gives him a definite job to perform. Further, that specific instructions regarding how to perform the different operations involved in the assigned job, together with an outline of information necessary to a proper understanding of the job, are given to the student as soon as he has completed the analysis of the specified job. Finally, that the teacher sees to it that all of this written matter is understood by the student before he is permitted to proceed with the performance of the job. In view of all these steps, I repeat, it is pertinent to inquire whether there is any place or even any need for a lesson plan in S's method.

My study of S's method has satisfied me that there is no place in it for the lesson plan as ordinarily conceived. More than that, I fail to see how a lesson plan of any type would be of much value in the face of facts as above portrayed. About the only thing that the teacher could do in the way of lesson planning under such conditions, that is, when the student already knows how to analyze a job, and when the various forms and specific information and instruction sheets are furnished with each job, is to prepare a series of questions bearing upon such phases of the different jobs as are likely to prove difficult for the students and to employ these questions in such a way that the student is enabled to think his way through. But I seriously doubt whether I would ever advise even this. The fact is, as intimated above, there is no place whatever in S's method for a lesson plan; and this primarily because he has devised something that is analagous in many ways to our self-serve stores and restaurants. But in both cases woe be to the person who cannot read the instructions.

Summary and Suggestions.

To the end that opportunity may be afforded for constructive suggestions a brief summary of the most important observations seems advisable at this point.

(1) Although starting from different bases and proceeding along entirely different routes both authors must be rated high on analysis and classification of subject-matter.

(2) On the graduation of subject-matter to student ability each ranks high in some respects and low in others. A's method is easily much superior to S's, for dealing with beginners, but probably in the hands of the average teacher would prove inferior for dealing with students who have passed the novice stage. That is to say, S's method, because of its "self-serve" nature, would probably, though not necessarily, prove to be the better method for use with adults as contrasted with immature learners. I use the word, necessarily ad-

[17] Op. cit. P. 56.
[18] Op. cit. "Much time and material may be saved by giving the beginner practice work on exercises involving the more difficult operations of the trade." P. 38.

visedly, because I believe that after the novice period in a would-be mechanic's learning career is over, the job analyses, as per A's method, should be less and less detailed in character, thus necessitating on the student's part the expenditure of more and more energy of analytical nature.

(3) With respect to lesson planning features there is no possibility of comparing the two methods since A's excellent details find no counterpart whatsoever in S's method, which, as has been pointed out, is of such nature that lesson plans of the usual type are useless.

A Final Word.

The more I study the two methods the more I am convinced that if I were teaching a trade I would work out a scheme whereby both methods would be employed in part. To the person who has not examined these methods carefully such an assertion may seem unreasonble; but, not so, I dare say, to the person who has rigorously scrutinized them. For despite their outstanding differences, these methods have much in common. For example, it is necessary in each case (1) that the various jobs be analyzed, (2) that trade information topics be carefully listed for presentation purposes, (3) that some sort of classification of jobs be undertaken, (4) that *why* questions be prepared in connection with each job, (5) finally, that suitable references for the different jobs be cited. In view of this fundamental fact, therefore, that jobs are jobs in any trade regardless of the angle from which they may be analyzed, it follows that much of the material prepared for use in either of the methods could, with slight modification, be made use of in the other. So I say, I would attempt to use both methods if I were teaching shop subjects.

As to when I would shift from A's method, either partially or entirely, to S's, would be determined by several factors among which the intelligence and general aggressiveness of the pupil or pupils concerned would be an important one. Certain it is that I would endeavor to seize the very first opportunity to shift to the student the responsibility of analyzing and planning. And since, as I have previously intimated, my contact with shop teachers has convinced me that they almost universally follow the line of least resistance, which is equivalent to saying that if they were using subject-matter organized in accordance with A's method they would continue to use the same complete job analysis regardless of the student's maturity, I incline strongly to the belief that the gradual introduction of S's method would inevitably assure better results. Especially would this be true in the case of that three-fourths or more of our shop teachers who lack the initiative and resourcefulness to use the job method to its fullest capacity. It is the well-being of these and the army of young people annually receiving instruction at their hands that I have in mind when I write as I do. What these teachers need and will continue to need is a method which makes it difficult, yes, practically impossible, for their pupils not to acquire from week to week an ever-increasing amount of self-directive ability.

Art Craft Work in Pyroxylin — II

Frank O. Kreager, Springfield, Mass.

STONE SETTING.

ONE of the most fascinating things in pyroxylin craft, both in work and results, is the setting of semi-precious and artificial stones. The brilliants set in factory-made combs and other articles are pressed in while hot. Because of the shape (facet-cut) of the brilliant, the fastening is never very secure and this accounts for the number that drop out. This fact, and the further fact that brilliants have been overworked in cheap jewelry, has led the pyroxylin craftsman to pass up the brilliants and to give his attention to the setting of semi-precious stones of cabochon cut, pearls and pearl blisters, flat stones of various shapes, and even the better grades of artificial stones. These stones can be set in pyroxylin very securely—as securely as the usual prong and bezel metal settings. The method in general consists in cutting an opening through one piece of pyroxylin, into which the stone will fit tightly and exactly, and then cementing another piece of pyroxylin on the back. The necessary steps are as follows:

Marking—Place the stone in the right position on the pyroxylin blank, which may be one piece or a series

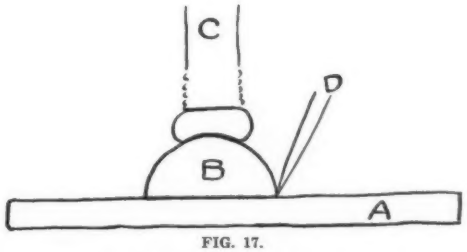


FIG. 17.

of overlays, and hold it firmly in place by pressing down hard on it with the rubber end of a lead pencil. The rubber is admirable for this purpose as it doesn't slip. With the point of a thin knife blade, or a needle set in a pen holder, scratch a mark around the stone and as close to it as possible. One mark is enough, two or three will only confuse. Now remove the stone and make a second mark inside the first and a sixteenth of an inch or less from it. In Fig. 17, A represents the pyroxylin blank, B the cabochon-cut stone, C the pencil, and D the knife blade or needle.

Sawing out—Drill a hole inside the second mark, insert and fasten the saw blade and saw out the material

with the saw held in such position that it follows the second mark on the top side and a projection of the first mark on the under side. A little study of Fig. 18 will make this clear—A is the blank, s. s.[1] the scratched outline of the stone, m. m.[1] the second line inside the first, while the line xy indicates the slant of the saw blade.

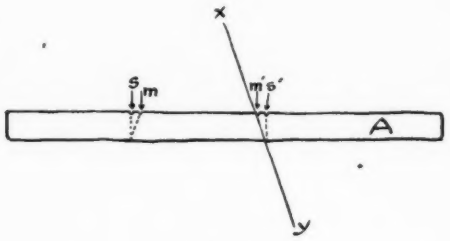


FIG. 18.

This slant of the saw corresponds to the bevel of the stone. The object is to get an opening into which the stone will exactly fit. It is better, of course, to make the opening too small than too large.

Fitting—After the sawing is done, fit the stone into the opening, hold it to the light so that the tight places may be seen and trimmed away with a fine-bladed sharp knife or small file. When the stone will almost go into place, soften the pyroxylin edges about the opening with amyl acetate cement applied with a brush. Allow the cement to be absorbed for a few minutes and then repeat. Enough of this treatment will soften the pyroxylin so that the stone may be forced into place. The best way to do this is to cut an opening the exact size of the stone in a smooth hardwood board, set the blank on the board in such a way that the stone fits into this opening. Cement a backing on to the blank and put a weight, a flat iron is about right, on top. This presses the stone into position and holds the two pieces together until they are firmly cemented. The blank should stay under the weight for about two hours. Fig. 19 represents a cross section of the stone B, fitted snugly into the blank A, and backed by a second piece of pyroxylin C.

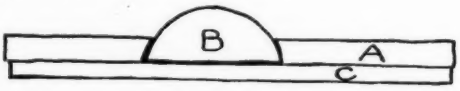


FIG. 19.

It is essential that the stone and surrounding pyroxylin fit exactly in front. In doing this it often happens that a larger opening than necessary will be cut in the back. After the stone has been put in place, and before the back piece has been placed, this opening can be filled with a paste made by evaporating the thick cement (clear pyroxylin dissolved in amyl acetate) to a jelly-like consistency. This cement jelly can be forced into the small opening with the blade of a knife. After this is done, the thin cement should be spread and the back cemented on in the usual way.

(LEFT) FIG. 20.
(ABOVE) FIG. 21.

A neat effect can be secured by cutting a small bevel around the stone with a sharp knife or skew chisel. This bevel should not be deep and its outer edge should extend to the line originally scratched about the stone.

A large number of pyroxylin craft articles may be enriched by stone-setting—fobs, pendants, brooches, stick pins, book ends, paper knives, jewel boxes—there is hardly a limit to the things that can be made. Very attractive semi-precious stones, together with a large assortment of abalone pearls, can be obtained at prices ranging from fifty cents, or less, up. A number of very beautiful artificial stones are on the market at from ten cents to fifteen cents each. For beginners these artificial stones are very satisfactory. Because of the wide range in color of the stones available, and the equally wide range in colors in which pyroxylin is made, unusually artistic color effects can be secured by stone setting combined with carving. Fig. 20 is a pendant of jade green overlaid with a thin sheet of transparent dark green, and set with a topaz. The pendant, Fig. 21, has a rich blue for the base, overlaid first with terra cotta and faced with mottled gold. It is set with a vegetable coral. The color combination is especially effective. Fig. 22 is a paper knife, the base of a semi-transparent wine color, and the handle overlaid with ivory and harmonizing shades of blue, green, and terra cotta. The handle when carved forms a background which re-echoes the brilliant blues, greens and browns of a large abalone pearl. The girdle buckle, Fig. 23 A and B, is a carved combination of lavender, terra cotta and green, set with good imitation jade. The carving in each case is done with a long-beveled U tool.

FIG. 22. A PAPER CUTTER.

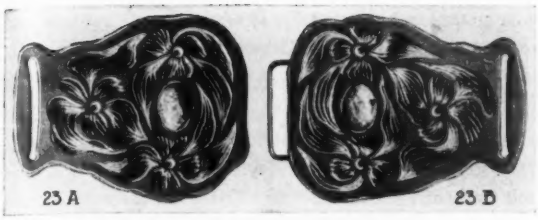


FIG. 23. BELT BUCKLES.

METAL FASTENING.

Fastenings for Stick Pins, Brooches and Buckles.

In many forms of pyroxylin craft work it is necessary, or desirable, to make metal attachments to the material in such work as stick pins, brooches and buckles. In general, the method consists in riveting the metal to one piece of pyroxylin and then cementing this piece to a second piece. In this way the rivet heads can be entirely hidden. Copper, brass and aluminum wire are very satisfactory for rivet material. Drill a hole in a piece of pyroxylin the size of the wire to be used for a rivet. Set the wire in the jaws of a vise with enough projecting above to go through the pyroxylin and form a rivet head; 1/16″ aluminum wire and a 1/16″ drill are admirable for the purpose. With a light hammer head up the rivet. A rivet headed in this way must have a pocket made in the second piece of pyroxylin to take the rivet head. A heading flush with the surface can be made by reaming out the head end of the hole, funnel shape, and hammering the metal down into this opening and then filing off flush with the surface. Such a rivet head doesn't require a pocket

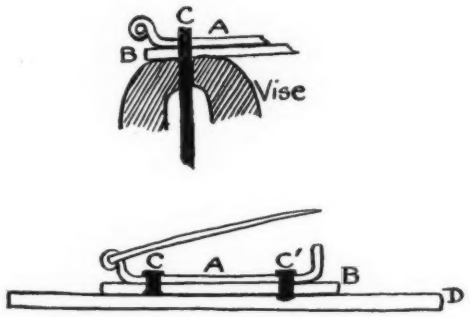


FIG. 24 (ABOVE). FIG. 25 (BELOW).

in the second piece. Figures 24 and 25 are cross section diagrams illustrating this method applied to the attaching of bar pin stems. In Fig. 24, C is the aluminum wire set in the vise, A is the metal pin stem, and B the piece of pyroxylin to which it is to be riveted. Fig. 25 shows the riveting completed and the piece B cemented to a second piece D. Notice that in the case of the raised head C, a pocket must be made in D to receive it, while in the case of the flush head C^1 no pocket is necessary.

Stem pins suitable for brooches may be had in quantities at from five cents to ten cents each. These pins have two holes about 1/32″ in diameter in the

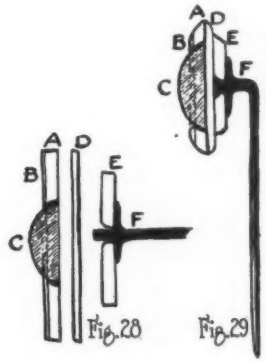
FIG. 26.

bar. Clamp the bar on to a piece of pyroxylin a little larger than the bar and with a 1/16″ drill enlarge the hole in the metal and at the same time drill a hole in the pyroxylin. Insert the aluminum wire, set the wire in a vise and proceed with the riveting. Be careful to use only gentle taps with the hammer as a heavy blow will bend and twist the rivet. After forming the heads on the bar-pin side, cut off the ends of the wire on the pyroxylin side, leaving about 1/16″ for forming the head. Turn the pin over on the anvil of the vise and head up the rivets. The pin is now ready to be cemented to a brooch, hat ornament or other article.

FIG. 27.

Figures 26 and 27 are brooches made in this way. The upper pin in Fig. 26 is old Assyrian and the lower is from the Japanese.

The making of a stick pin is illustrated in Figures 28 and 29. In Fig. 28, A is the base piece of pyroxylin which may be overlaid with one or more layers B. C is the stone set in A, D is the back, while F is the



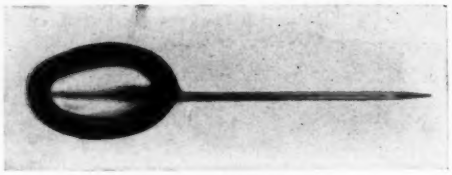


FIG. 30. A STICK PIN.

metal pin stem, set in a hole bored to receive it in another piece of material E. Notice the shoulder on the pin. Straight pins without plates or shoulders are not suitable for this work. Fig. 29 shows the riveting done, the parts cemented together, trimmed and the pin shank bent. Fig. 30 is a photograph of stick pins made in this way.

Pins may be had that have both the necessary shoulder plate and the projecting end for forming the rivet. Such a pin may be made by making the plate, drilling and soldering to a straight pin. The cost of the pins ready-made should be about ten cents each.

Buckle fastenings—Fastenings for girdle buckles, Fig. 23 A and B, may be made either of wire (brass, or copper is good), or of strips of bent pyroxylin. In the latter case the eye is formed by sawing and the hook by heating and bending. Most of the commercial buckles have fastenings of this kind. An examination of a few of these fastenings will make clear the method. The metal fastenings are much stronger and neater in every way. The wire should be bent into shape and riveted to a piece of material. This piece is then cemented to the back of the buckle. Ingenious craftsmen will find a large number of ways of making these fastenings.

A concluding article will explain the making of jewel boxes and articles ornamented with floral decorations made from rod pyroxylin.

Vocational Guidance in the High Schools of Atlanta, Georgia

Harold H. Bixler, Director of Guidance and Research.

IN most public school systems, vocational guidance is strictly a function of the high school. Although this article will describe the guidance program only in the Atlanta high schools, it must not be inferred that there is no guidance in the elementary schools. Even as low as the fourth, fifth and sixth grades, there is a crying need for guidance. In Atlanta, the child in these grades makes his first acquaintance with the field of industry and occupational life through the study of geography, history and science. Projects in art, commerce, gardening, and industrial arts, supplemented by excursions and definite study of local industries, introduce him to the world outside the classroom.

The group which most needs guidance in the elementary school is the group of those who drop out. Frequently, there is a tremendous loss between the elementary and the high school. To prevent this wastage, a whirlwind "go-to-high-school campaign" is staged each year for the class leaving the elementary school. Posters, bulletins, talks by teachers, supervisors and business men, parent-teacher association meetings, and even street cars are used as avenues for arousing the ambition to go to high school. In "Two Bells," the weekly leaflet placed in all street cars, the following appeal was printed:

Both Columns Offer Themselves, Which Will You Choose?

1. To begin with $8.00 a week? Or to begin with $20.00 a week?

2. To begin in the waiting line? Or to begin on the preferred list?

3. To be a stoker on the voyage of life? Or to be a commanding officer?

4. To limp through life's race on three cylinders? Or to win on eight cylinders?

5. To be waiting for a job? Or to have a job waiting for you?

The Vocational Guidance Information Card.

One other feature of vocational guidance in the elementary school is closely related to high school work. This is the vocational guidance information card. On one side of this card, the pupil during his last year in the elementary school, records his vocational and educational preferences and interests. It is a type of self-analysis blank. On the back of the card, the teacher records intelligence test scores and her estimates of his abilities and tendencies; and comments, if necessary, on his vocational choice. The card, which is planned as a cumulative record during the remainder of the pupil's school life, is then sent to the high school. The high school counselor henceforth is in charge of these records, and uses them constantly in interviews and placements.

Drop Outs.

Some pupils drop out to go to work. In Atlanta, however, this group last year was remarkable small, constituting only four and five-tenths per cent of the total number promoted. The vocational guidance cards of these pupils are sent to the central placement office. Personal letters from the superintendent and members of civic organizations such as the rotary club are mailed to them. Atlanta's unusual educational opportunities in the way of night schools and part-time opportunity school are thus brought to their attention. If the boy, however, is compelled to go to work, the guidance card is of great value to the placement counselor in placement and follow-up work.

Try-Out Courses.

But let us suppose that Joe, a particular boy friend of ours, has regularly entered upon his high school course. How and where does vocational guidance assist him? Possibly he is enrolled in a technical course. Then in the wood shop, mechanical drawing room, ma-

chine shop, or other equally fascinating shop or laboratory he is "trying himself out." Or perhaps in a classical college preparatory course he is getting acquainted with algebra, Latin and French. His special aptitudes may thus be revealed, and with the counsel of his teachers he may be able to determine his life-career aim.

The Class in Vocational Civics.

Meanwhile, during the last half of the freshman year, Joe is taking a vocational civics course, in which he learns more of his school and its courses, his city and its industries, and the occupational world with its problems and opportunities. By way of parentheses, it may be said at this point that in the new six-three-three, or junior-high-school plan of organization, this course will be given in the junior high school. One semester, probably the low seventh, will be devoted to a study of the city of Atlanta. The course in vocations or occupational information will also be a semester course, coming during a later year in the junior high school. The following excerpt from a course of study in another city (Newton, Mass.), may prove illuminating:

"Aims of the class in occupational information:
1. To show the value and dignity of work.
2. To show the absolute dependence of one worker on all other workers.
3. To teach the value, dignity and opportunities in the mechanical occupations.
4. To give the right ideas with regard to the requirements of occupations, and to correct many wrong impressions with regard to the contents and manufacture of some products.
5. To give such information in regard to occupations that it will make a child interested in analyzing himself to see in what field he may qualify.
6. To save, if possible, much time now wasted by pupils ignorant of the requirements for occupations.
7. To lay more stress on the worker as a social unit than upon the occupation or the product."

This class can be made intensely interesting and of vital value by different methods of attack, such as:

1. Talks or free discussion by pupils.
2. Debates. Example: Resolved, that every girl should prepare both for home making and a definite life-career outside the home.
3. Notebooks. Pictures cut from magazines, clippings from newspapers, etc., add to the attractiveness of such notebooks.
4. Booklets on specific vocations, such as the doctor, dairyman, etc. Each pupil selects three occupations in which he is most interested; from these choices the teacher may assign the vocation to be studied, thus preventing several members of the class from investigating the same vocation. Material for these booklets is collected by library reading, personal interviews with persons engaged in the vocation, etc.
5. Movies, slides, charts and other visual aids.
6. Dramatizations. Examples: Hiring, help; buying a farm, etc.
7. Visits by small groups to offices, stores and industrial plants.
8. Visits to schools and colleges, with intensive study of their courses.

Interviews with Failures and Misfits.

But to return to Joe, let us suppose that during his first semester in high school he has considerable difficulty with some subject, such as algebra, and is doing unsatisfactory work. A small card stating this fact is sent to the vocational counselor of the school. Joe is called in for an interview during a free period or after school. A sympathetic counselor can frequently discover the reason for failure and set about to remedy it. A card or letter may be mailed to the parents asking for their cooperation. Other more stringent measures, such as assignment to a coaching class, are often necessary. Every week a follow-up card is sent to the subject teacher under whom the failure occurred, for a progress report. This elaborate procedure takes time and effort, but it gets results. It should be stated that the full procedure as outlined above has been in operation only since October, 1922, in the Commercial High School under the direction of Mrs. Annie T. Wise, principal, and Miss Mary P. Aiken, vocational counselor, assisted by the vocational guidance committee. In the other high schools a simpler procedure is in operation, along the same general lines.

Other Types of Personal Interviews.

It should not be imagined that vocational guidance is exclusively concerned with the misfit or failure. Although this educational guidance, as it is frequently called, is most important and brings immediate, visible results, we do not limit our efforts to it alone. Pupils are constantly coming to the counselor and principal for advice about the choice of high school or college courses, or information and assistance in getting jobs. The vocational guidance information card referred to above, is particularly helpful here. At the end of each semester these cards are distributed to the first period or home room teachers. Pupils who have not previously filled out the cards are given an opportunity to do so. The teacher then records his ratings and recommendations on the back of the card, after studying the pupil's side of the card, and gives any counsel he can.

The cards are then returned to the vocational counselor, and provision is made for special interviews with pupils having difficult problems. These special interviews may be arranged with the counselor, the director of vocational guidance, or the junior counselor from the school employment office. The following are typical cases: Anne is in her senior year, three months from graduation. Her father has just died and the family is in immediate need. What can be done? Although we have no scholarship fund, private individuals can usually be interested in advancing a loan. A part-time job may also be secured with the assistance of the school employment office.

George, a senior in the technical high school, came to my office recently in the following dilemma. He will have sufficient units to graduate, but not properly distributed to admit him to Georgia Tech. He wants to be an architectural draftsman, but is limited financially, so that even if supplemented by his own earnings, two years is the maximum time he can stay in school. Where shall he go?

A bank was considering Lewis for the responsible position of bank runner or messenger. His school record shows that he has been truant, and his teacher does not feel like recommending him. Investigation showed,

however, that he was strictly honest, and a real, live, energetic boy. He got the job.

Vocational Opportunity Campaign.

The vocational opportunity campaign aims to give the high school pupils, and particularly the seniors, first-hand information about various vocations. Representative business and professional men and women are invited to address the students on their respective fields of work. Last year this campaign was conducted intensively during a period of eight weeks in April and May, with one speech every week. This year the talks are being given at various times during the year, averaging one or two a month.

Publicity Methods.

To show the value of education and to stimulate thought about a life career, printed vocational guidance bulletins are posted weekly on the bulletin boards in halls and classrooms. During the spring, a special effort is made to interest every student by an intensive vocational guidance week campaign. Special displays of posters, charts, and pamphlets are arranged by pupils and by the vocational guidance committees on the main bulletins boards in the halls. The high school papers publish feature articles, devoting practically an entire issue to this purpose. Particularly interesting articles were written by pupils on such subjects as "the value of algebra," "stenography," "thoughts for a boy leaving school," etc.

Vocational Guidance and English.

The themes and articles above referred to suggest the splendid possibilities for vocational guidance values in the teaching of English. The English departments in the Atlanta high schools are fully aware of the importance of live theme subjects that offer an avenue for the pupil to express his interests. A committee composed of the heads of the English departments and a few others decided on a series of theme subjects for each year from the sixth through the high school. Overlapping will thus be avoided and progressive development of the whole field is assured.

Conclusions.

Since the aim of vocational guidance is to help the pupil find himself, we can readily understand that it touches every phase of public school work. Many principals and teachers have been active in vocational guidance work for years without calling it by that name. As the movement develops and gains momentum, a scientific technique is slowly evolving. Nevertheless, there is much that every teacher, principal, and superintendent can do with his own boys and girls, after a little study and thought.

Household Grinding Machine

Henry P. Boettcher, Jersey City, N. J.

THIS job is intended to give the pupils concrete work in machine shop practice. It has not only educational value with plenty of trade content, but also commercial value. The pupils are keenly interested because they are doing work for which there is a demand and which brings in the many operations on lathe, milling machine, universal grinding machine, drill press, speed lathe, hardening, etc. Work of this productice type is necessary for the proper development of boys taking up the machinists' trade.

When this job was outlined it was my aim to provide more gear cutting and machining of cast iron for my class. It has proven very interesting work for my pupils. Teachers in looking over the drawings will find that the job is composed of sizeable work.

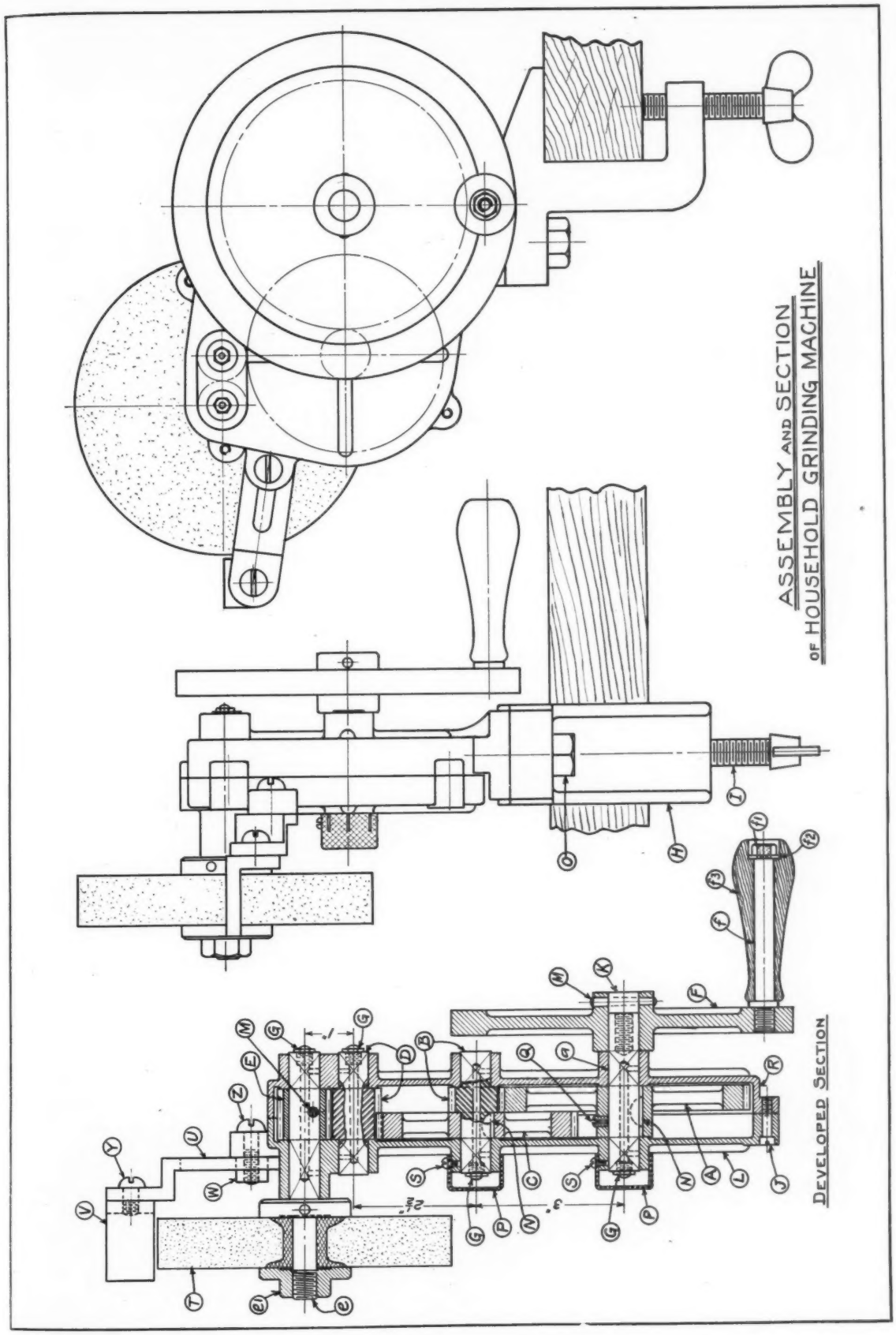
The usefulness of a grinder, such as that shown in the accompanying drawings, for manual training shops and school kitchens is obvious. After the machine-and-tool department has supplied the wants of the school shop departments in this line it might sell grinders to the pupils for the cost of the material.

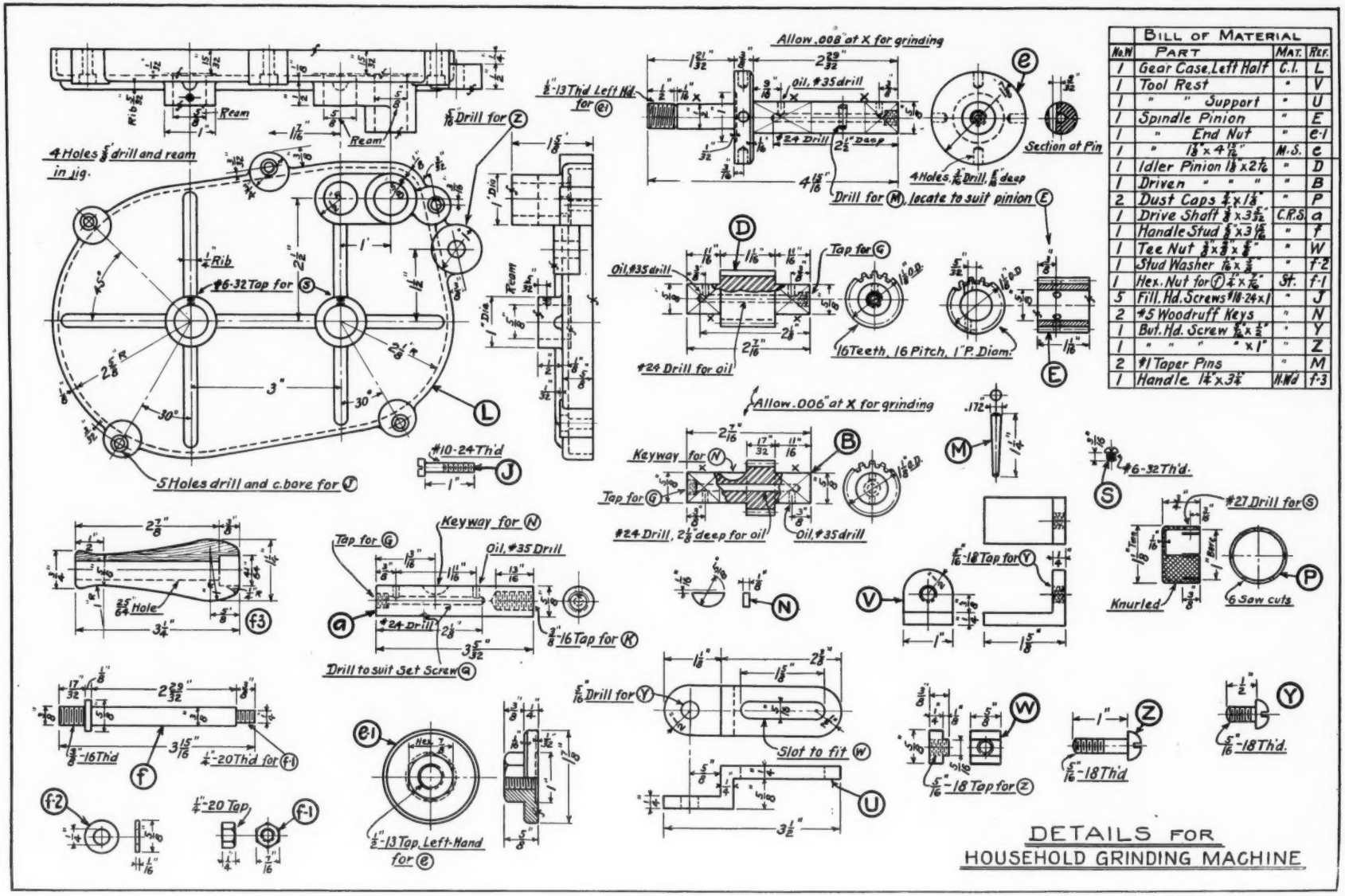
The grinder is a sturdy and durable machine of heavy construction. The machine is quite universal in that it can be swung to any position convenient for the operator while it is clamped to a bench—a desirable feature. Speed is a very important factor in attaining good and rapid results when grinding tools. This phase of the job I have also given due consideration. Its speed is twenty to one (20:1), that is, one turn of the crank wheel will give twenty turns to the emery wheel. An operator will turn the crank wheel approximately 150 times per minute, averaging about 3,000 r. p. m. for the emery wheel. For a 6″ diameter emery wheel this means approximately 5,000 surface feet per minute as the cutting speed of the wheel. The crank wheel besides imparting motion has the effect of a fly-wheel; it promotes a uniformly steady motion and tends to obviate pounding and vibration.

A foot-power attachment can easily be applied by extending shaft (a) beyond the crank wheel and removing the handle (f-3). In fact, any of the attachments that are made for the popular grinders, such as the American and the Pike, can be made for this machine or probably purchased from the above named concerns if the making of same does not fit into the work of the school shop.

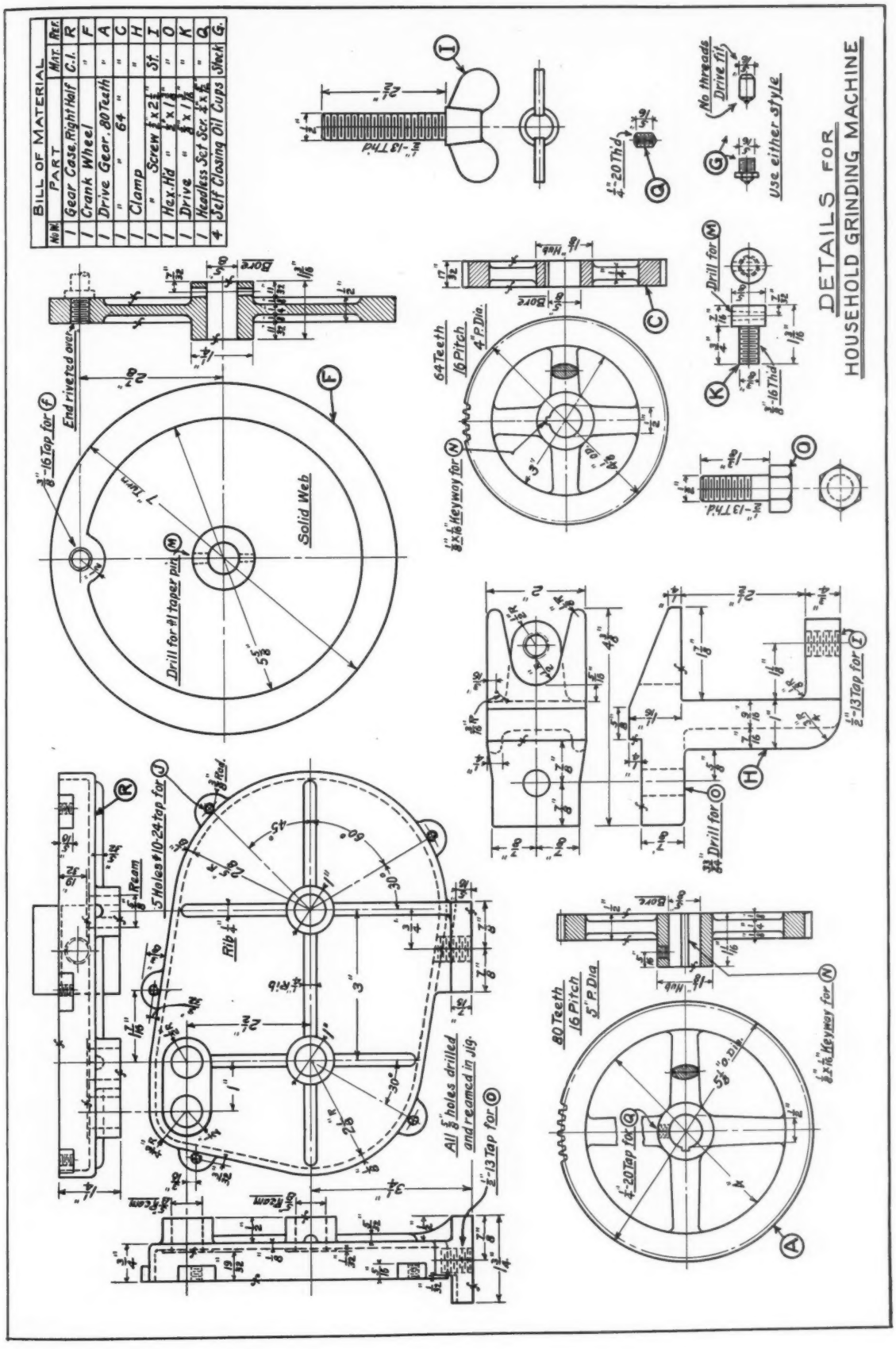
Balance and proportion have been given much thought in designing the machine. At the same time I have kept in mind the fact that I was planning a proper sequence of operations for pupils in machine shop practice, and last but not least, I strove for beauty in design.

The gears are so designed that the cutting of the teeth is not too far away from the support-mandrel or arbor, and the holes in them are sufficiently large to


ASSEMBLY AND SECTION
OF HOUSEHOLD GRINDING MACHINE
DEVELOPED SECTION



Bill of Material			
No.	Part	Mat.	Ref.
1	Gear Case, Left Half	C.I.	L
1	Tool Rest	"	V
1	" " Support	"	U
1	Spindle Pinion	"	E
1	" End Nut	"	e-1
1	" 1⅛ x 4 12/16"	M.S.	C
1	Idler Pinion 1⅛ x 2 7/16	"	D
1	Driven " " "	"	B
2	Dust Caps ¼ x 1⅛"	"	P
1	Drive Shaft ⅜ x 3 5/32"	C.R.S.	a
1	Handle Stud ⅝ x 3 1/16	"	T
1	Tee Nut ⅜ x ⅜ x ⅝"	"	W
1	Stud Washer 1/16 x ⅜	"	f-2
1	Hex. Nut for f ¼" x 7/16"	St.	f-1
5	Fill. Hd. Screws 1/16-24 x 1	"	J
2	#5 Woodruff Keys	"	N
1	But. Hd. Screw ¼" x ⅜"	"	Y
1	" " " " x 1"	"	Z
2	#1 Taper Pins	"	M
1	Handle 1¼ x 3¼	W.Wd	f-3


BILL OF MATERIAL
No. | PART | MAT. | Ref.
1 | Gear Case, Right Half | C.I. | R
1 | Crank Wheel | " | F
1 | Drive Gear, 80 Teeth | " | A
1 | " " 64 " | " | C
1 | Clamp | " | H
1 | " Screw ¼ x 2½" | St. | I
1 | Hex. Hd " ¼ x 1¼" | " | O
1 | Drive " ¼ x 1⅛" | " | K
1 | Headless Set Scr. ¼ x ¼ | " | Q
4 | Self Closing Oil Cups | Stock | G.
DETAILS FOR HOUSEHOLD GRINDING MACHINE
Solid Web
Drill for #1 taper pin
End riveted over
⅜"-16 Tap for F
64 Teeth 16 Pitch 4" P. Dia.
⅛"x⅛" Keyway for N
80 Teeth 16 Pitch 5" P. Dia
5" O. Dia.
¼"-20 Tap for A
All ⅜" holes drilled and reamed in jig.
⅜"-13 Tap for O
5 Holes #10-24 tap for J
Rib
Ream
Drill for O
⅜"-13 Tap for I
⅜"-16 Thd.
Drill for M
No threads Drive fit
Use either style
¼"-20 Thd.

obviate chattering when turning the perimeter of same in the lathe and when cutting the teeth in the milling machine. On almost every part of which this grinder is composed the pupil can take a good healthy cut.

Self-closing oil cups are used to prevent any grit or dust from entering the bearings, and if the two halves of the gear case—Parts R and L—are ground on a disc grinder or machined so as to have contact all round on the faces that join, the gears can be run in a heavy oil to insure quiet running. However, I have not found it necessary to do this.

The two halves of the gear case R and L are drilled and reamed at one time in a jig. Only ⅝" diameter shaft holes are taken care of in the jig that I have. A jig for drilling all the holes in the gear case would promote production. However, accuracy in the location of the screw holes is not as important as in the shaft holes which determine the center distances of the gears.

Note that the crank wheel F screws into and fits over the driving shaft (a). This feature prevents motion in the wrong direction. Should the operator turn the crank wheel in the reverse direction it would unscrew. This feature also facilitates the removal of the crank wheel. There are no set screws to mar the shaft. The flange of the spindle (e) has four pin holes to enable the operator to hold the spindle while mounting or removing the emery wheel.

Dust caps P are provided where necessary. They are made of machine steel cut off about 10" long, centered, faced, and turned down to the required diameter, then knurled and cut up to the required lengths after which they are faced, spotted and drilled to size while held in the chuck of the lathe. A second drill, whose lips are ground almost square with the axis, is used to cut the bottom of the dust cap square. This can also be accomplished with a boring tool.

Slits are then cut in caps in the milling machine or with a hack saw. Of course, a circular milling cutter will give a neater job. The purpose of the slits is to enable the caps to adjust themselves to the lugs of the gear case and fit tightly over the same. Cast iron gears mesh with machine steel pinions. The idler pinion D which is used to impart motion to gear E in the proper direction runs on a tool steel shaft to prevent scoring, or they might be made of one piece and to run in end bearings. Without gear D it would be necessary to turn crank wheel F in the reverse direction which is contrary to habit and common practice.

I would recommend that part of the clamp H, to which the gear case is screwed, be made a trifle higher —about ¼". There will then be more room for the fingers between the crank wheel handle (f-3) and the bench to which the grinder is clamped while turning the crank wheel. Another way to accomplish the same is to reduce the distance of handle (f-3) from the center of the crank wheel. This is being done in the writer's classes because it does not require any change in our patterns.

The only jigs and fixtures that the class uses outside of the one for locating, drilling and reaming the gear shaft holes in the gear case are:

Jig for locating pin holes in the flange of the spindle.

Auxiliary collar (B 1) to fit over the driven pinion shaft (long end) so that the gear cutter will not cut into the dog while the job is being held between the milling machine centers while cutting the gear teeth.

Vise (B^ae) for holding those parts which are to be drilled for oil holes and tapped for oil cups.

Of course, drilling and tapping these holes can be done in the lathe but I found that doing it in the drill press with the vise (B^ae) is a very expedient method. Not only that, but it makes more work for the drill press and bench which most teachers welcome. The teacher will use his own discretion not only in this but some of the other things.

A class can turn out a quantity of these grinding machines in a term and thus see the application of their work. This job has been planned with a view to proper sequence of operations and giving some real concrete problems in machine shop practice.

Let me add: no teacher should lose sight of the fact that the product of his classroom or shop is pupils trained in the art of machine shop practice and not how much can be produced in new tools and machinery in the course of a year.

Mixing Colored Printing Inks

Robert F. Saladé, Philadelphia.

COLOR mixing as done by pressmen in the printing trade is an art calling for both experience and fine judgment upon the part of the person doing the work. In many printing and publishing plants it is the practice to have one especially-trained pressman attend to all of the color mixing required in the plant, instead of allowing all of the pressmen to mix their own colors for various jobs. This plan saves time, labor and expense, as the expert color-mixer can do the work to the greatest advantage for all concerned by reason of his constant and broad experience.

In the average printing plant, however, it would not be practicable to have one pressman do all color mixing, mainly for the reason that only a limited amount of color printing is done in the average plant, and there would not be enough color mixing required to keep one man busy. This means that the average

printing pressman should be capable of manipulating the standard colors and shades of printing ink so that any special color or tint may be mixed when needed.

Every pressman who desires to become a first-class craftsman must study the manufacture of printing inks and learn the essential facts about the pigments, chemicals, dyes, oils, etc., which enter into their composition. A good workman should be thoroughly familiar with the tools and materials used in his trade. In the public libraries are to be found numerous instructive books on printing ink subjects, and the pressman may gain a great deal of useful information by carefully studying such books. When you understand the manufacture of printing inks, and know the chemicals and other materials which are used in their making, you will naturally be in a position to manipulate the inks most successfully as the occasion demands.

In these days, printing inks are being made in a great variety of colors and tints, ready for use in the pressroom, but the requirements of printers and publishers are so varied that it would be impossible to have a sufficient assortment of colors and tints ready mixed to provide for all jobs of color printing. It is a scientific fact that there is no end to the different shades of colors and tints. For example, there are many different shades of red, and it is always possible to mix up a new shade of red. The Turkish rug-makers are said to use something like three thousand shades of brown alone in the yarns which go into their beautiful rugs. Of blue there are hundreds of shades. And, so is it with green, gray, pink, yellow or any other color.

Perhaps the most difficult task in the pressroom is mixing some odd color of printing ink to match the color of something like a ribbon, a piece of silk cord, etc. For example, a fancy dance program may be tied with ribbon of emerald green color, and it may be desired to have a design or reading matter printed in the same color as that of the ribbon on the program cover. Often the pressman is called upon to mix a special color for such an occasion, and at times he finds it necessary to mix a color that will match the color of paper, cover-stock, leather, mat-board, and so forth.

In pressrooms where the finest kinds of color printing are done, the pressmen often mix special colors which perfectly match the colors of such things as an art vase, a semi-precious stone, a flower, a piece of tinted stone, a piece of furniture, piece of fabric or the leaf of a plant. These are merely a few illustrations to give some idea of the extraordinary color-mixing being done. The writer recalls a case where an art object worth thousands of dollars was on exhibit in a well-known museum. The directors of the museum were about to publish a souvenir booklet and they desired to show in the booklet, a picture of the object referred to in its actual color, which was a peculiar shade of green. The printer who received the order for the booklet sent an expert pressman to the museum for the purpose of studying the color of the art object. Upon returning to the plant this pressman mixed up several different shades of special green. Press-proofs of the half-tone plate (representing the art subject) were then taken in the various shades of green. When the proofs had dried they were sent to the directors of the museum so that the right selection of color could be made. One of the special shades of green on the proofs was found to perfectly match the odd color of the subject. This case is mentioned to explain the care which must be taken in some color-mixing.

On special order a printing ink manufacturing firm will mix an odd, or unusual, color of ink to match the color of any subject, but in some cases it is necessary to mix several batches of color before the desired result is obtained. For this reason color-matching is usually done in the pressroom, the mixing being done with inks selected from those in stock. The pressman who is experienced in color-mixing has the instinct of an artist; he can match almost any color or tint from memory, and he understands exactly what colors to use, and the right proportions of the colors essential. Moreover, he knows how to mix up just about the right quantity of special color that will be needed to complete a job.

The beginner in color-mixing should find the following information helpful:

First of all, make cleanliness a habit. The ink-knife and surface on which the color-mixing is done should always be perfectly clean for each mixing job. The best and most economical ink slab is a piece of plate-glass. The glass does not absorb oil or color; after it has been washed with a white cloth and benzine, another color can be mixed upon it without being affected by the color previously mixed.

While it is true that all colors and tints can be produced from the three primary colors, yellow, red and blue, and with the use of black and white, this rule does not always work out well with printing inks. There is no such thing as a *standard* yellow, red or blue printing ink. Every ink manufacturing concern has its own standard of colors. And, in printing inks there are many different yellows, reds, blues, etc., as for instance, "scarlet lake," "brilliant scarlet," "process red," "railroad red" and "geranium red."

It is possible, of course, to purchase yellow, red and blue printing inks which may be regarded as standard colors to be used for the purpose of mixing other colors, but it may be necessary to experiment with various yellows, reds and blues before the right ones are procured. In a well-equipped pressroom a variety of colors should be carried in stock, such as vermilion red, scarlet lake, dark red, bronze blue, deep blue, lemon yellow, chrome yellow, process yellow, red and blue, mixing whites, and job blacks. From this assortment of "standard" colors practically any special color or tint can be made.

The most satisfactory results in color mixing come when all the inks used are from the same manufac-

turer. By this we mean that it is not a good plan to buy red inks from one manufacturer, blue inks from another, and a yellow ink from still another manufacturer, then expect these different makes of ink to mix well together. If you want to maintain standard colors in your pressroom, buy your inks from one manufacturer and have that manufacturer supply inks of standard colors to suit your requirements.

The leading ink manufacturers supply several different kinds of mixing white, including a flake white, transparent white, "magnesia" white and a plain white of heavy body. The printer who frequently does color mixing should keep in stock a substantial quantity of at least two kinds of mixing white—plain flake white and transparent white. The flake white may be used for mixing a delicate tint of any kind that is to be printed as a background for other colors, or for a tint that is to form solid parts of an illustration. The transparent white may be used for a tint that is to be printed over the surface of colors which have been previously printed. The transparent white is also recommended for flat tints of large proportions to be worked on a platen press, such as a solid tint background for a street car card, or a solid background for a catalog cover. The great advantage of the transparent mixing white is that a tint produced with it can be applied to the surface of a picture or other subject after all the other colors have been printed. Instead of printing the tint first, as would usually be the case with a regular opaque tint, the transparent tint is applied as a finishing operation.

It is no doubt understood that when a transparent tint is printed over other colors these colors show through the tint, to such an extent that it would seem to one not familiar with the process that the tint had been printed first. A tint produced with transparent white has a soft, silky and translucent appearance which is desired in fine color work, especially pictorial work. On the other hand, a tint mixed with plain white having a heavy body is better than a transparent tint, in cases where a solid tint with heavy covering capacity is desired. When a glossy tint is desired, add a small portion of copal varnish to the inks.

The modern lake colors, which are produced from coal tar dyes, are being used not only in process color work, but also in the making of tints and regular colors. The lake colors include all the principal colors such as yellow, red, blue, green, orange, brown and purple, and they work perfectly with either a regular white or a transparent white. When a solid tint is wanted that will not have a mottled appearance in the completed work, first mix up a small quantity of the tint desired from a lake color and regular white, then mix this tint into a quantity of transparent white. If the mottled effect still shows when the plate is worked with this kind of tint, it may be necessary to add a small amount of castile soap, finely powdered, to the ink. Common yellow soap is also frequently used for this purpose. The soap acts as a binder between the pigment and vehicle (the oil) and thus causes the ink to lie flat and unbroken on the surface of the paper.

Process colored inks—yellow, red and blue—like those used for reproducing colored pictures from process plates—are excellent for the purpose of mixing tints. These process colors are brilliant and transparent, and from the yellow, red and blue many colors can be mixed which afterwards could be utilized to make a tint, if desired. For example, red and blue will make purple; blue and yellow will make green; red and yellow will make orange, and so on. With the essential parts of yellow, red and blue a beautiful shade of olive green can be produced—a shade that will be more clear and bright than an olive green made with yellow and black.

It is well to remember that when mixing colors of any hue desired the *light* color should first be placed on the mixing slab, then add the darker color, gradually and carefully, until the wanted color is obtained. Let us imagine that a sepia-brown is to be mixed. This ordinarily calls for 20 parts of orange to 1 part black. First, mix an orange by adding a small part of lake red to a quantity of lemon yellow. Then add black to the orange—one-twentieth the amount of black as the amount of orange on the mixing slab. Manipulate the mass of ink with a pallet knife until the color is perfectly mixed. Practice will enable you to pre-determine the amount of color needed for each job. Now in the case of sepia-brown just considered, suppose that about two pounds would be needed for the job: To make the two pounds we would use about one and one-half pounds of yellow. The red and black inks, added to this quantity in the right proportions, would make the two pounds of sepia-brown.

As we have stated, there is no such thing as a standard color or tint. In color mixing you really have to set your own standards. Do not be misled by such titles as, "geranium-red," "railroad red," "royal blue," etc. These titles mean little, as every ink manufacturer has his own ideas as to the correct shades of such colors. As there are geraniums of various shades of red, how can a "geranium-red" ink serve to duplicate all of these shades? It simply cannot be done, unless you mix other shades of red with the "geranium-red" to obtain the exact color desired in each case.

By the plan of keeping in stock supplies of vermilion-red, dark red, lake-red, brilliant scarlet, etc., you will be in a position to mix up from these various reds any special shade of red that may be wanted. This is about the only way for you to make a "standard" red, but as a matter of fact, no "standard" red could be produced which would be suitable for all kinds of paper. You have to study the quality and finish of the paper for every important job before mixing the ink. A brilliant scarlet ink would print dark on one kind of white paper; the same ink would print in a medium tone on another kind of white paper, and it

would print in a light, pinkish tone on still another kind of white stock. By a combination of different shades of red, you can mix a red ink to look well on any kind of paper, but it becomes necessary, of course, to make practical tests so that the best color for each kind of paper can be selected. In time you will have standards of your own, as: For type printing on white writing paper, 4 parts brilliant scarlet and 6 parts lake red. For type printing on coated paper, 8 parts brilliant scarlet and 2 parts vermilion-red. These are merely suggestions as to formula, but they will serve to show how a pressman can perfect his own "standard" colors for various kinds of paper.

We offer in the following paragraphs several simple charts which should be helpful to the beginner in color-mixing:

Browns By Two-Color Mixtures.

Color	Parts	
Green-brown	2 red	4 green
Red-brown	12 red	1 black
Yellow-brown	4 yellow	3 red-brown
Purple-brown	6 red	1 deep blue
Chocolate-brown	12 red	2 deep blue
Copper-brown	15 vermilion	1 black
Sepia-brown	20 orange	1 black
Maroon-brown	15 red	2 black
Photo-brown	1 vermilion	1 black
Snuff-brown	8 vermilion	1 deep blue
Tan-brown	2 yellow	1 purple
Bronze-brown	2 bronze-red	1 bronze-blue
Brown-black	1 red	1 black
Brown-tint	1 red-brown	40 white
Yellow-brown tint	1 yellow-brown	30 white

In the mixing of the lighter tones of brown, a small portion of lemon yellow can always be added to advantage. In the darker tones of brown a touch of orange or chrome-yellow will produce a warm, pleasing effect. As to the red inks used for mixing browns, a scarlet or crimson will be found best for the deeper shades of brown, while a lake-red is adapted to the lighter shades of brown. A beautiful chocolate brown can be made with 10 parts vermilion, 3 parts chrome yellow and 2 parts black. Different tones of rich chocolate brown can be produced by changing this formula according to your own ideas. A pleasing tone of maroon can be made with 10 parts scarlet-lake and 4 parts burnt sienna brown. This tone of maroon can be changed to a hundred-and-one different tones by adding to it small portions of yellow, orange, chrome-yellow and red.

Greens by Two-Color Mixtures.

Color	Parts	
Regular green	1 blue	4 yellow
Bright green	1 deep blue	5 yellow
Dark green	2 blue	1 yellow
Dark Green, medium	1 blue	1 yellow
Light green	1 green (reg.)	1 yellow
Emerald green	1 green (reg.)	3 white
Brilliant green	1 green (reg.)	4 yellow
Yellow-green	1 deep blue	80 yellow
Orange-green	1 deep blue	60 yellow
Blue-green	2 deep blue	4 green (reg.)
Sea-green	1 blue	6 green (reg.)
Green-black, dark	1 blue-green	3 black
Green-black, light	5 blue-green	1 black
Olive green	1 blue	4 orange
Olive green, light	4 yellow	1 black
Olive green, dark	4 yellow	2 black
Sage green	4 green-black	6 white
Bronze-green	2 bronze-blue	3 yellow
Japanese green	20 emerald green	1 black
Green tint	2 bright green	30 white
Grass-green	1 bronze-green	1 bright green
Jade green	2 green (reg.)	2 white

Lemon yellow is generally used in mixing light tones of green, while chrome yellow is used in mixing deep tones of green. Sometimes by mixing a 50-50 composition of lemon yellow and chrome yellow better results are obtained than by using only a lemon yellow or chrome yellow. A green that appears too dark and lifeless can be brightened up with a touch of orange.

Grays by Two-Color Mixtures.

Color	Parts	
Regular gray	12 white	1 black
Red-gray, light	6 regular gray	1 lake red
Red-gray, dark	10 regular gray	2 lake red
Yellow-gray	8 regular gray	1 yellow
Drab-gray	15 regular gray	1 orange
Green-gray	8 regular gray	1 green
Blue-gray	4 regular gray	1 blue
Purple-gray	8 regular gray	1 purple
Lead-gray	15 regular gray	1 deep blue
Warm gray	12 regular gray	1 vermilion
Dark gray	12 white	2 black
Light gray	20 white	1 black
Shell-pink gray	80 white	1 lake red

Pleasing shades of gray are among the most popular tints, and both regular white and transparent white are used in mixing these tints. If a gray tint is to work over a subject which has previously been printed in colors, a transparent white will be essential for the tint. If the tint is to be printed as a background for other colors, it should be mixed with a regular white. Always start with the white ink, and add the color just a little at a time to the white. Never put a pallet knife containing color into a can of mixing white.

As to reducers for colored inks, these should be used with the greatest care. Whenever possible, do not use any reducer in a colored ink or tint, as a reducer will weaken the color to a certain extent. Under no circumstances use kerosene, benzine, vaseline, cocoanut oil or hogs' lard as a reducer for colored ink, as any of these oils or greases will cut the body of the ink and "kill" the color, or at least affect the color so that it will soon fade under sunlight.

In most cases where reducing is essential a few drops of special reducing varnish will serve the purpose. Order this reducing varnish from an ink manufacturing firm, explaining that it is to be used for colored inks. There are a number of patented paste driers on the market which may be used as reducers for either colored inks or delicate tints. It should be understood that the drying quality of any printing ink must be adapted to the paper used and the speed of the press.

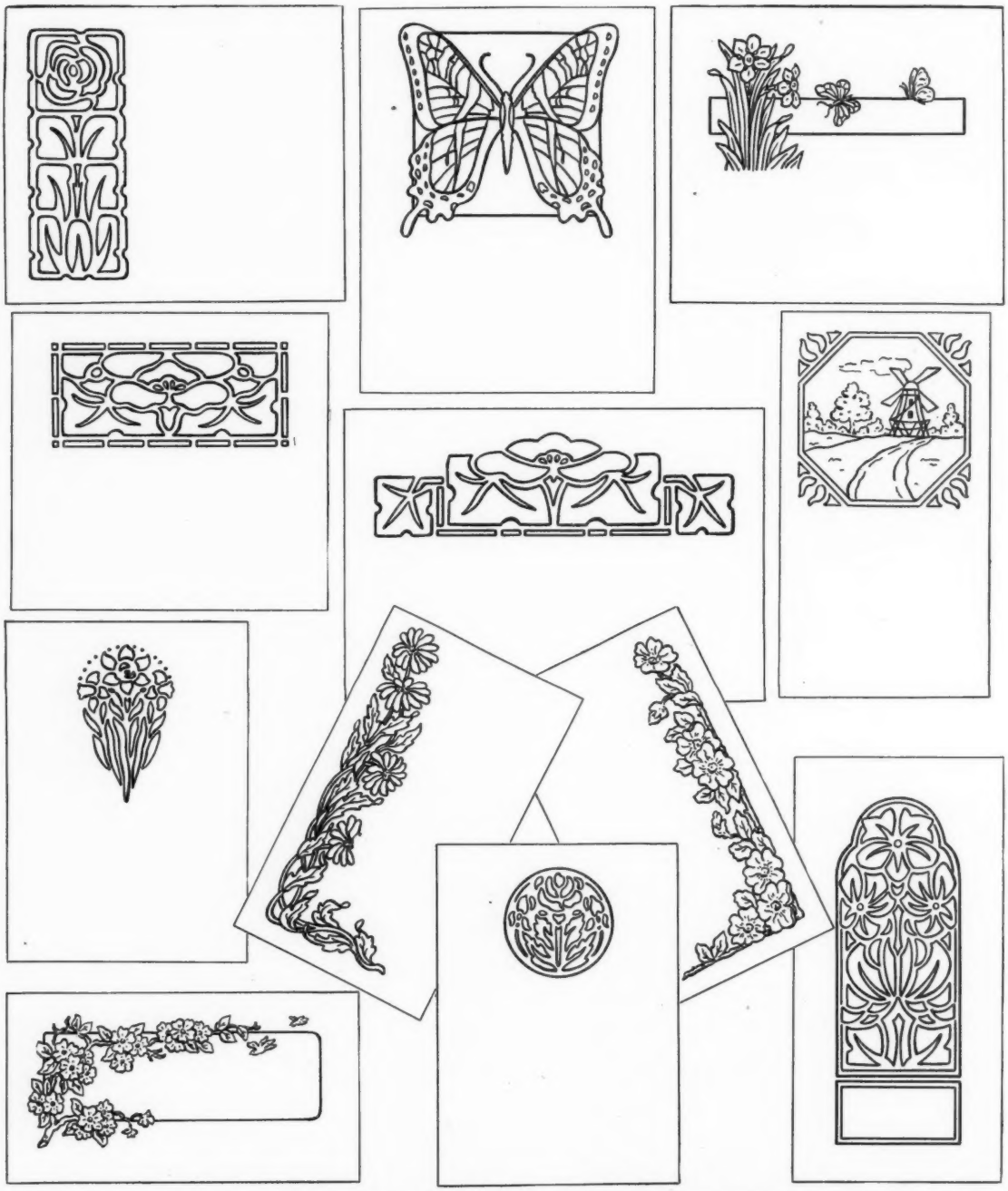
Purples by Two-Color Mixtures.

Color	Parts	
Regular purple	10 rose-lake	1 blue
Light purple	2 reg. purple	1 white
Violet	4 rose-lake	1 deep blue
Violet-blue	10 violet	1 blue
Bright violet	1 reg. purple	1 blue
Scarlet purple	15 rose-lake	1 deep blue
Purple tint	1 reg. purple	50 white
Violet tint	1 violet	30 white
Typewriter purple	1 reg. purple	1 white

Broadly speaking, the inks used on flat-bed cylinder presses and platen presses should have a heavier body than the inks used on high-speed web and rotary presses.

Lithographic inks should be used for a form that is to be printed on thick cover stock. The lithographic inks will be supplied by any large printing ink concern in any color or tint desired, also in "cover" white.

A wide range of printing is now being done with gold printing ink and with silver ink. The material for a gold or silver ink comes from the manufacturer in two forms—liquid and powder. The pressman should mix from the liquid and powder a fresh supply of either the gold or silver ink for each job. A ready-mixed gold or silver, left standing for a long time, is not satistory.



SUGGESTIONS FOR DESIGNS FOR CARDS. THE PLATE HAS BEEN REDUCED NINE-SIXTEENTHS. THE DESIGNS ON PAGE 433 ARE FULL SIZE AND SUGGEST THE WEIGHT OF LINE AND TECHNIQUE.

USEFUL DECORATIVE DESIGNS

D. Elizabeth Roberts, Philadelphia, Pa.

ONE design will often serve many different purposes. All of the designs illustrated can be used for greeting cards, especially birthday greetings. A pleasing sentiment can be written or printed on the card, or merely a few words, as "Birthday Greetings" or "Best Wishes."

These cards are attractive, made of rough art paper, either white or tinted, with the outline in India ink and the design tinted with water colors. Many can be used as folders, with a greeting or verse inside.

Some of these designs make attractive place cards or menu cards. The butterfly, the birds-and-blossoms design and the narcissus and butterflies are especially suitable for place cards.

A few of the designs will make attractive decorations for calendars. A stiff cardboard or heavy paper may be used as a foundation; a small calendar pad may be mounted at the bottom of the card, and a bow of narrow ribbon may be added. The windmill and butterfly are especially good for calendars.

There are many other ways in which these designs can be used; some are more appropriate for one use and some for another. In decorating small objects, one often needs a small conventional design, and the present collection can be used for many such novelties, as blotters, penwipers, small memorandum books, purses, envelope sachets, small boxes, etc., and last but not least for the decoration of candle shades. For instance, the small conventional daffodil design or the circular rose design can be used for the shade, repeating the motive as often as necessary and connecting them by bands or lines. Any of the conventional motives can be used in a similar manner. The two corner designs, the daisy and wild rose, make a very good decoration for the cover of a small memorandum or address book.

No doubt there are many other uses for these designs, and for work in the schoolroom, it will be good practice for the pupils to adapt the designs to different objects, changing or enlarging them to fill given spaces.

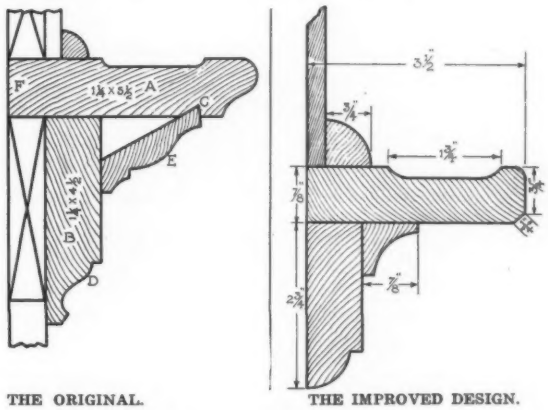
WHAT IS WRONG HERE? THE REPLY

In the October issue of the INDUSTRIAL-ARTS MAGAZINE we printed an illustration under the heading "What Is Wrong Here?" (Fig. 1.) A considerable number of excellent solutions to the problem were received. The best letter came from Mr. Richard M. Gubsch, Columbus, Ohio. Mr. Gubsch's sketch is reproduced in Fig. 2.

The Criticism:

Dear Editor:

Inclosed please find my criticism and a full-sized drawing of a more economical and fitting construction for a chalk rail. For convenience in criticizing, I have indicated the parts of the inclosed drawing from Magazine by the capital letters A, B, C, D, E and F.



THE ORIGINAL. THE IMPROVED DESIGN.

1. Economic use of material.
   a. Waste of material, too wide and too thick.
   b. Too wide and too thick.
   e. Moulding too wide.
2. Good construction.
   f. Poorly constructed. Too difficult to place.
   c. All out of reason. Groove too hard to cut, waste of time, moulding too hard to fit.
3. General utility.
   a. Designing of mouldings poorly selected. Too many corners, therefore hard to keep clean.

The second best reply was received from Mr. W. J. Groschke, Erie, Pa., and the third best reply from Mr. Ed Davis, Hays, Kans.

A check for $5.00 has been mailed to Mr. Gubsch.

INDUSTRIAL-ARTS MAGAZINE

E. J. LAKE S. J. VAUGHN

Editors

EDITORIAL

ART APPRECIATION.

We hope the day is coming when a work of art will be something to *enjoy* rather than something *to do* or to hang on the wall when it is done.

This means that it must be something more than an intellectual product arrived at by rule and regulation; and yet rule and regulation have their most essential part in works of art. It means that the product must *satisfy* the emotional longing for beauty, for the fitness of things, for the adjustment of means to purposes.

Appreciation is the crucial test of one's training and ability, or of one's artistic sense. To stand before a masterpiece and *analyze* it may be a tribute to one's *art knowledge* without being a test of one's art instinct or endowment. But to get *joy and satisfaction* out of a masterpiece—*to appreciate* it—that is the essence of art.

Not all, unfortunately, have the artistic sense or endowment in great degree, but all can by training and study achieve something of the ability to appreciate art in its various forms. Therefore, much emphasis should be placed by teachers of art upon the matter of art appreciation among the children in the schools.

INDUSTRIAL ARTS INSTEAD OF MANUAL TRAINING.

There are evidences in every convention exhibit that the old fashioned manual training is still struggling to survive. One can still see rows of sleeve boards, coat hangers, book racks, and foot stools of exactly the same dimensions and designs that we of the older generation used as "models" twenty-five or thirty years ago.

They are not necessarily bad in themselves, if they serve the present purposes well. But the absolute uniformity lays them open to the suspicion that the old, discarded theory of manual training prompted their construction rather than any purpose to meet a definite need or to furnish some industrial information.

It was this defect that drove manual training into the background and brought *industrial arts* courses into the public schools. Other aims in addition to skill have come to be recognized in the shop work. Individual initiative, industrial information, knowledge of materials, methods of production, means of distribution, and numerous other considerations have now found places in the industrial arts courses. Thus enriched, such courses have met the criticism of the opponents of practical shop work in the public schools. It is well for a teacher to carry over all that is good in the old manual training into the enriched and vitalized field of industrial arts work.

WIDER USE FOR PUBLIC AND SCHOOL LIBRARIES.

Every day we receive questions the answers to which could easily be found in almost any public or school library. We are glad to receive the questions and to attempt to answer them, but we desire to emphasize the fact that in almost every community there is a veritable mine of information in the form of a library.

Frequently questions are asked about forests and forestry, forest products and lumbering, and a variety of related matters. The Government publications are the most voluminous, most authoritative, and the most easily procurable works on such topics. It is possible for every public and school library to have such documents, and they can usually be had entirely without cost. All that is necessary, usually, is to address a request to the department or bureau under which the subjects come, or to send the request to a Representative or Senator from the state from which the inquiry comes.

Too little attention is being paid to such a source of information and too little use is being made of the wealth of good material which the United States Government is constantly collecting and issuing in usable form.

The Government material is particularly abundant in the fields of industry, commerce, and agriculture. Teachers of any lines of work related to these fields would do well to ascertain how fully their local libraries have taken advantage of the Government's willingness to supply this valuable material. In case the libraries have not availed themselves of such opportunity, the teachers should take the initiative in getting the matter attended to. Then they should cooperate in every way to make it known that such a valuable source of information is available for the use of all who are interested in any of the subjects treated.

THE PRACTICE OF CHASTIZING BOARDS OF EDUCATION.

It is reasonable to assert that public praise and public censure are seldom meted out in the degree that they are deserved. In the thought that school authorities, however, deserve all the public praise that is usually so sparingly given them, it is equally true that they frequently come in for more censure than they deserve.

Occasionally censure arises out of conditions and for causes that are entirely new. The introduction of vocational studies, for instance, has aroused a new form of criticism. There are still those who believe that the schools should remain within their original function of offering cultural studies only, and others who believe that the development of vocational training is progressing too slowly.

The shortage of skilled mechanics in the building trades has not only prompted the idea of fostering vocational subjects, but is on the other hand beginning to arouse censure where the schools have, owing to

financial reasons, been somewhat circumspect in the introduction of such studies.

Thus, the American Contractor, a leading building journal, after discussing the shortage of mechanics in some of the Ohio cities, undertakes to say that some boards of education are exasperatingly slow in providing apprentice training. In a recent number it said:

"Recent history, it would seem, should have remade school boards into the hottest partisans of vocational education. With hundreds of school buildings all over the land held up because of a shortage in the trowel trades, and with tens of millions of dollars' worth of school property tied up uselessly for months because the approaching school term will open and be far under way before these delayed buildings will be in position to receive students, these purely selfish reasons should alone be enough to swing the distracted directors of education behind a training campaign that would not only solve the building problems of future school boards but would also confer a blessing on the youngsters who might otherwise go into the world as common laborers—minus the advantage of a trade.

"We wonder if the real facts regarding the delays in building programs have been forcibly enough presented to the boards of education and the public whom they are supposed to represent. May there not still be some lingering doubt in the minds of these educational bodies that the whole blame lies on the shoulders of the contractor who has failed to deliver a finished building in the time specified? Surely no group of sensible executives could do otherwise than cooperate with a movement for the training of apprentices if they really understood the weight of the shortage incubus, which is borne alike by contractors and by the general public."

The above edges to the point where the school authorities are made to share in the blame for the shortage of skilled labor. While the school authorities have long recognized a tendency in the industrial activities to relegate the old time apprentice system, they have with commendable enterprise assumed a new responsibility in recruiting the industrial army.

It does not follow, however, that if industry has shifted the burden of training its apprentices to the schools, that the latter are subject to blame if they are somewhat slow in rendering the new service asked for at their hands. The adjustments, in adding vocational training to the regular school courses, are not always readily found. This is particularly true in the face of the fact that school costs have been mounting in recent years and that in many instances the tax limits have been strained. Municipal financing has become a serious problem, and just as the building contractor has had to contend with higher costs and a labor shortage, so the school authorities have been faced with embarrassing adjustments between restricted budgets and increased costs.

When the history of industrial education in this country is contemplated, in all its essential bearings, it will also be found that the manufacturer was the first to prompt the educator to come to his rescue in providing trained workers. With the advent of the machine and quantity production, together with the restrictions imposed by labor unions, the old time apprentice system fell into disuse. The trade schools, technical, high and continuation schools have already made a commendable contribution to the industrial efficiency of the nation.

In the light of this history, and the accomplishments of the schools in the field of industrial education, it is scarcely becoming on the part of the building trades to pass criticism upon the school authorities for having failed to meet all the requirements of an exceptional situation.

THE VITAL PROBLEM.

According to the teacher who devises a problem it is "vital" to the subject. This is because the teacher plans the problem to teach most important things. All problems originated or adopted by industrial-art teachers are vital to the teachers. It remains for the teacher to make them vital to the pupils.

There is strong evidence that much of the work done in the name of industrial arts consists of exercises copied directly from published designs.

If the mathematical teacher should copy on the board a problem in arithmetic showing the method of solving the problem and the result, and require the pupils to merely recopy from the board, the class might gain a little in penmanship but would gain little or nothing in arithmetic.

If the industrial-arts teacher places a blue print copy of a model in the pupil's hands and requires him to make a model of the same identical form, he may gain a little skill in the use of tools and in the reading of working drawings, but he will have learned little or nothing of design.

Having dispensed with our former system of exercises in wood and metal which were planned to teach constructive device and give shop practice, we have substituted a series of so-called problems and projects with the purpose of teaching the device and design of industrial products in a wider range of materials and use.

If these problems and projects are not properly used by the teacher to develop understanding and originality they have little advantage and some disadvantages over the old system of exercises.

We may not expect school children to get up new inventions of mechanical or scientific interest. They must be taught definite things in order to express themselves in design. We may expect them to learn by doing, as original, things that have been done in various ways before. To this purpose every "vital" problem in school work should offer study of composition.

The most vital problem can be completely devitalized in the method of presenting it to a class.

—"Vocational education is an essential part of a democratic scheme of education," is the assertion made by R. O. Small, director of vocational education in Massachusetts. "Culture and character I recognize as prime essentials for our people and our nation. But since when has the sole source of development of culture been found in the traditional school program? The world has acquired its culture from homely sources: its powers of appreciation have in every instance started from the doing of things which stimulated thinking about them."

Paper Batik

Ray J. Matasek, Instructor in Milwaukee Vocational School.

THIS method of drawing is one which is very interesting because the artist never knows just how the finished picture will be. The effect when the drawing has been completed is somewhat like a linoleum cut, although it has a certain charm all its own.

Working in this method will fill the needs for something new for the commercial artist as well as for the student.

Materials.

The materials necessary are those which every art student and artist has, consisting of a good grade of ink paper or illustration board, a few brushes, depending on the size and technique desired in the finished drawing, a bottle of Higgin's or some other good waterproof ink, a tube or a jar of Chinese white, and a small amount of some other color, preferably blue if the work is to be reproduced by the line method.

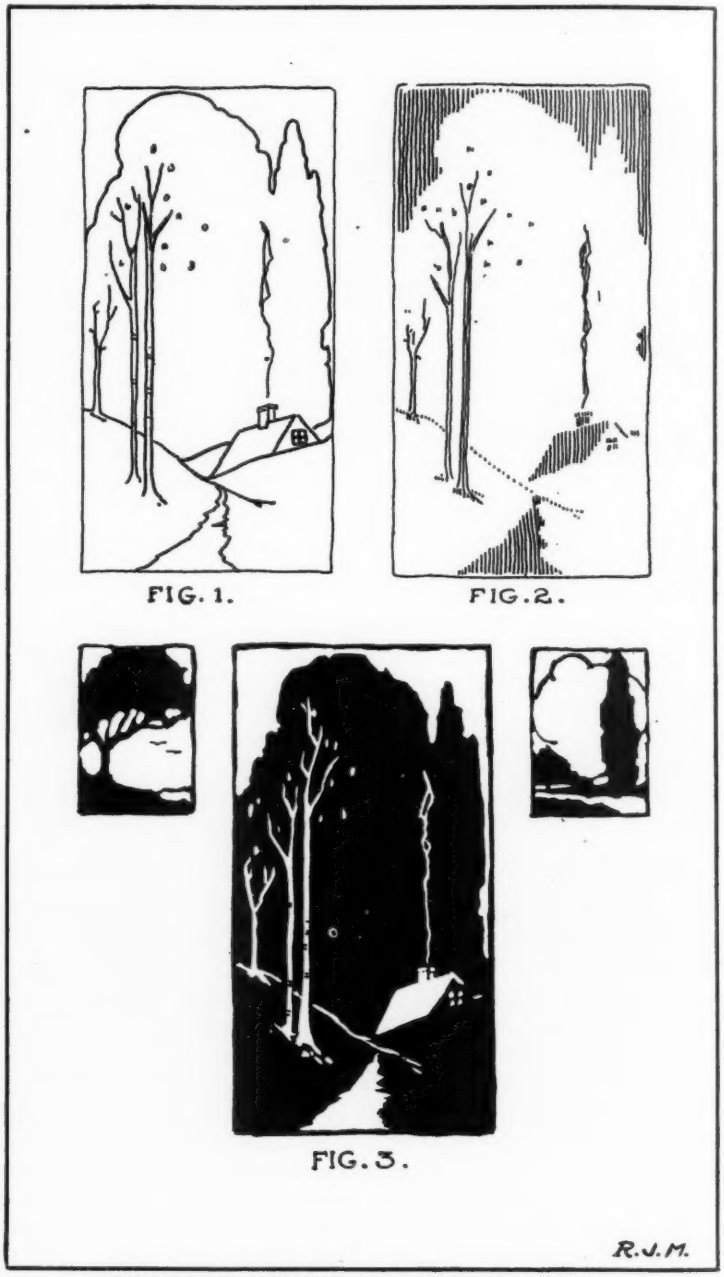
Method.

The first thing necessary is to make a careful drawing, in pencil, of the object to be worked in batik. Try to keep the drawing in big masses of light and shade. The fewer intermediate tones there are the better and more striking will be the finished result. Fig. 1 shows a pencil outline of the scene to be rendered in batik.

The second step is to mix a quantity of Chinese white with just enough of the other color in it so that it can be easily seen when working on the white paper. Next take your brush, dip it in the Chinese white and apply it to the parts of the picture you wish to remain white. Cover this part of the paper thoroughly with the paint. This is absolutely necessary as will be seen later. The shaded parts of the drawing in Fig. 2 indicate those parts which have been covered with Chinese white.

After the Chinese white has thoroughly dried, which takes only a few minutes, take a large wash brush, dip it into the waterproof ink, and starting at the top of the paper, draw it quickly across the entire drawing from left to right. Continue this operation until the entire drawing has been covered, being careful, however, not to go over the work a second time while the drawing is still wet, as the Chinese white might mix with the ink and thus spoil the labors of several hours.

After the ink has thoroughly dried, this can be seen when it begins to crack where it covers the white, take the drawing over to the water faucet and allow the water to run over it. This will start to wash the ink off where it covered the white and also to wash off the white itself. The large wash brush can also be used at



EXAMPLES OF PAPER BATIK DRAWN BY THE AUTHOR.

this time to help clean off the drawing. Care must be taken not to rub too hard or a dirty surface will be the result. Fig. 3 shows a finished batik in black and white.

Colored Paper Batik.

Many interesting experiments can be tried in color when the work is not to be used for a black and white line cut reproduction.

Mix a small amount of the colors you wish to use in separate saucers with Chinese white and apply these colors to the drawing just as before. After the colors have dried, ink is washed over the entire drawing just as for the black and white batik. After the ink has been washed off part of the color comes with it, leaving a drawing in black and very dainty tints.

A Practical Course in Sheet Metal Pattern Drafting

An Outline by F. M. Dannenfelser, Superintendent Industrial Training Department of Rehabilitation of Ohio State Board, Toledo, Ohio.

The Subject Matter.

Courses in sheet metal pattern drafting should be developed so as to give to journeymen and apprentice sheet metal workers, and all others who have need of, and are interested in the subject, the ability to lay out patterns for the work they must construct. To do this intelligently and expeditiously for the great variety of forms being used in the constructive industries today, the imaginative and visualizing powers, and the ability to think in three dimensions must be taught and developed. A study of the following subjects will train these powers and make one proficient and expert in sheet metal pattern drafting.

I. The Definitions and Constructions of Applied Geometry.

An understanding of geometrical definitions gives one the ability to understand more readily the terms which are used in books on sheet metal drafting, in trade journals, and other technical literature. To make geometrical construction readily is of great aid, and a time saver in laying out work. The student who has not had this work will often ask,—What is a tangent? What is meant by bisect and trisect? It is a part of the language of drafting. Geometry should not be taken up as a separate subject but should be applied to the problems in question as the work progresses.

II. Simple Projections of Points, Lines, Planes and Solids.

Projection is the basis of all drafting. Too much emphasis cannot be given it. One who thoroughly understands the principles of projection will have little difficulty in developing patterns for any form, no matter how difficult. Like geometry, projections should be taught by using practical sheet metal forms for problems.

III. True Length of Lines.

This really comes under the caption of projection, but being a fundamental principle which is used very often, it is of utmost importance and so is given a separate heading. The true length of lines in various positions should be found. Various methods of finding the true length of lines should be demonstrated and discussed.

IV. True Forms on Miter Lines or Lines of Intersection.

This is often needed when the form is made up of more than one piece. A talk and demonstration on the plane sections of geometrical solids such as prisms, cylinders, cones, pyramids, etc., will be of great help in developing the power to visualize what the true forms on miter lines should be, and the best methods of obtaining them. The method of finding lines of intersection should be taken up in the order of their difficulty and as the need for them is presented. The methods of finding these lines by planes and spheres should be illustrated and explained.

V. General Method of Developing Surfaces by Parallel Lines.

This is termed in the shop "straight work." It takes up such problems as mitres of pipes, tees, elbows, y's, rain water cut-off, smoke jackets, gutters, cornices, etc. It is called parallel line development because all lines or elements on the surface are parallel to each other and parallel to one of the planes of projection.

VI. General Method of Developing Surfaces by Radial Lines.

It is called conical, flaring, or tapering work. All forms developed by this method are portions of cones. The lines or elements lie on the surface of a cone. When a cone is developed the lines in the pattern radiate from a point, hence the name "radial lines" which has been given to this method.

VII. Triangulation.

This is the most important of the three methods of developing patterns. For a long time triangulation was looked upon as a very difficult and mysterious subject. However, this attitude of mind is changing—the average student realizing that with a proper amount of effort and instruction the subject is easily mastered. Triangulation is very simple—it being nothing more than an understanding of finding the true length of a line—that the horizontal projection is one side of a right-angle triangle and the other side the vertical distance between the projectors from the extremities of the vertical projection. Having the two sides of the right-angle triangle given, the hypotenuse is drawn which is the true length. In finding true lengths, we use the right triangle, hence the name triangulation. By this method, patterns for a great number of forms are developed; a few of which are, exhaust hoods, hoppers, reducers, transition pieces, furnace fittings, branches, forks, bull-heads, chutes, conveyors, transition elbows, separators, auto hoods, fenders, cowls, radiator shells, etc.

VIII. Problems Involving the Use of the "Development of Opening."

Finding the development of opening is necessary in about only five per cent or less of the problems in triangulation, but when needed is absolutely essential to the correct solution. The principle of "laying-out" is the same as for a development problem, in fact, it is a pattern covering the opening. It is used to find the true distance around the edge of a pattern, when this distance does not show in its true length in any view of the projection drawing. It is practically the same principle as used in finding the true form on mitre lines or lines of intersection. Examples of this type would be round and elliptical bosses on round tanks, forge hoods, auto seats, cowls, etc.

IX. Analysis and Classification of Surfaces.

One should ask himself—Is it single curved or double curved or warped, or a combination of these? If single curved, must it be solved by parallel or radial lines, or both? If a warped surface, it must be developed by triangulation. Double curved surfaces can only be approximately developed as in the case of the sphere. Single curved and warped surfaces are sometimes called ruled surfaces because straight lines can be drawn upon them. Is it a portion of some geometrical solid?

X. Mensuration.

The sheet metal man is often called upon to make computations regarding areas; diameters, and heights of tanks of various shapes and capacities, length of skylight

bars, etc. Many sheet metal men have admitted the weakness of the trade in this branch of their work. The time to bring the attention of students to this subject is when some member of the class has need for it in his shop work.

XI. The work as outlined above should not be given in order, that is, a course should not start with geometrical problems, or the theory of projection or half the class will quit the first week. We must remember that this is a practical subject used by practical men, so we must handle the subject from that point of view. Every problem must be a practical one. During the solution of these problems the need for the theory will manifest itself. Then is the psychological moment to explain the geometry, projection, or computation as the case requires. Then will the need for the theory be strong in the mind of the student. With the need comes the interest. In that way the theory or principle is more easily and readily assimilated. This from experience is the best way to hold the interest of school classes.

XII. Giving any definite daily lesson plan for this work is almost impossible. The conditions vary according to community, teacher, and class. Some communities will want boilerwork; others, cornice and skylight work; another blowpiping; a fourth, a general line of work as used in jobbing shops; another furnace work; etc. Of course the principles for laying out this varied line of work are the same, but the problems differ and so it is difficult to design a set of lesson plans which will fit the needs of, and be satisfactory to all concerned. The ability, training and experience of the teacher will vary. One will have had good theoretical training, another only practical work. The ideal instructor is one who has had good training and wide practical experience. The class will vary; some will want to start from the beginning and take a complete course, others will want only a special line of work as mentioned above — under community. The imaginative and visualizing powers of the men will vary, making it possible for one man to grasp a principle in a few minutes, while another will have to work many problems embodying the same principle in order to instill by repetition the principle in his mind. It is well known that man is more imitative than he is imaginative. In any classification of intelligence, it would be found that the mentality of the majority would average while the imaginative and visualizing powers would greatly vary. It is this variation in these powers that make the subject of sheet metal pattern drafting which falls under head of the applied graphics, a difficult subject to teach.

The first night or two, all students, regardless of their experience should work out the same problem as explained at the blackboard. An instructor has not time to start a dozen men on different problems. This will give him an opportunity to talk with the men and note the kind of work and how difficult a problem in that work each member of the class requires. Often small groups can be formed who want the same work and in this way the principles can be explained to several at a time.

Parallel lines is the simplest method of developing surfaces, so the beginner should start with such problems as tees, elbows, gutters, simple cornice, etc., which are solved by this method. The work should be graded, each succeeding problem slightly more difficult. It is wise to ask a class what kind of work they want to start with. In this way the majority can be satisfied.

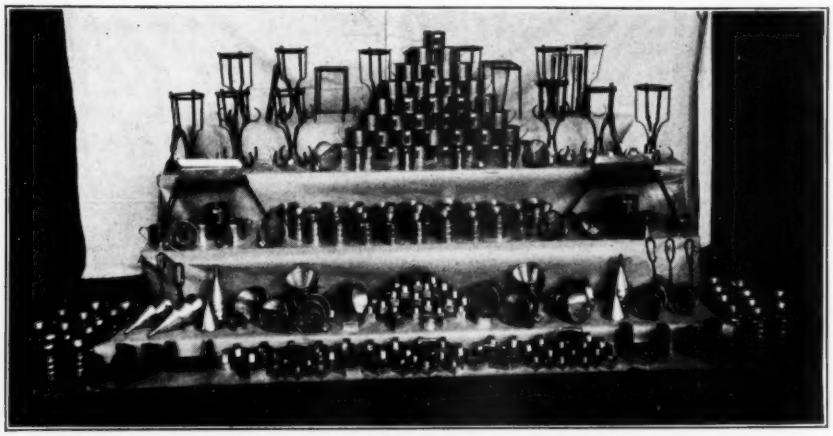
A graded series of problems in radial line developments would make up the second part of the course, although from experience it has been found good practice to give just a few lectures and demonstrations and have a few problems worked on this subject, and then pass on to triangulation for which the average shop man has greater use and because of this use, greater interest. When he has mastered triangulation, the more difficult problems using lines of intersection and solved by parallel and radial lines can be given. In starting triangulation, a simple problem such as a chimney smoke hood should be used. The lectures and demonstrations should be very thorough giving explanation in detail of each step necessary for the delineation.

XIII. Thought Sequence in Drafting Operations necessary For Solving a Sheet metal Pattern Problem.

(a) Classify the surface.
(b) Make necessary projection drawing depicting form of object. Views should be chosen with an idea of finding miter lines or lines of intersection, and true lengths. In other words, keep in mind that these must be found and choose views that will enable one to find them with facility.
(c) Draw the lines or elements on the surface of the form in the various views of the projection drawing.
(d) Find miter lines or lines of intersection.
(e) Find true form on miter lines or lines of intersection.
(f) Find true lengths.
(g) Find development of opening (if necessary).
(h) Develop pattern.

To solve a problem in pattern drafting intelligently one must follow this natural order or sequence.

Problems should be solved with as few a number of lines and views or partial views as possible. The average shop is not equipped with drafting board, tee square, triangles, etc., but has only a carpenter's steel square, a straight edge, folding rule, dividers and trammels. These shop tools are more awkward to manipulate than drafting instruments. And so the fewer the number of lines used in laying out a problem the better. The call is for speed—"get the work out" so short methods and a small number



EXAMPLES OF SHEET METAL WORK FROM NEWARK, N. J.

of lines are in order. Of course in demonstrating a principle, a greater number of lines must be used than is the case when developing a pattern for one's own use. This fact should be explained to the class.

Trade journals and sheet metal books should be used for reference. The men should be encouraged to subscribe to at least one trade paper and buy at least one good book on sheet metal pattern drafting and one on mensuration for sheet metal workers. If they own these books many of them will study at home and so greater progress in the work will be obtained.

There are several methods of presenting the problems to the class. One is by making blackboard drawings and explaining each step at the blackboard. Definite sizes can be placed on the projection drawing on the blackboard or the men allowed to assume their own sizes. By assuming their own dimensions a greater variety of patterns result. These, the men like to study and compare with their own solution. The second and best method of presenting the problems to the class is to have a book of problems in specification sheet form giving just data enough to work the problem and no more. In conjunction with these specification sheets, the problems should be explained and demonstrated step by step at the blackboard, and individually at the student's table. If in the day time the problems have to be erased from the blackboard the men still have the problem in specification sheet form, to work with the following nights. A greater variety of work can be given in this way.

Copying drawings from blue prints and books should never be allowed, for it will not develop expert sheet metal pattern cutters. Copying will not make one understand the principles involved. When allowed to do this the student can solve only those problems whose forms are identical with those copied—if given another form embodying the same principle, he is lost. Most of the explanations and demonstrations will have to be individual, and for this reason a class should not be larger in number than eighteen to get the best results.

XIV. Salesmanship.

The drafting work must be sold to the class in the same way as any other commodity. The night school student will ask himself, "What am I going to get out of this anyway?" I rush home from work, eat a hasty meal and rush back to night school. What am I going to get to repay me for this effort?" And he is right in asking these questions. At the beginning of the course a brief outline of the purpose and scope of the work will do much to arouse interest, and bring in new recruits. Students should be encouraged to bring in problems that they have been, or are now working on in the shops. Developing patterns for the work they are at present employed on will do much toward stimulating interest. Coming to night school is hard work and students must have their interest aroused and stimulated continually.

One cannot make an effort for another—all that any instructor can do is to furnish interesting and practical problems and then stimulate interest in the work. The following motives have been found useful in selling the work to students, increased wages, better job, increased ability and power, greater satisfaction, a sense of pride, caution, etc.

If you don't care for the work don't teach it; if you like it, be enthusiastic about it. Use one of the selling motives above mentioned in an enthusiastic appeal to the reason or the emotions of the students as the case requires. We all realize what a big factor personality is in teaching—and enthusiasm is the dynamics of your personality.

Advertise your work. Use the following mediums: pamphlets, posters, newspapers, word of mouth, exhibits, etc.

TYPICAL PROBLEMS FOR SHEET METAL DRAFTING.

Parallel Lines.

Mitres of Pipes.
Straight Tees.
Oblique Tees.
Y's of Equal Diameter.
Rain Water Cut-off.
Ventilators or Chimney Caps.
Square Return Miters.
Mitred Roof Gutters.
Roof Gutters with Leaders.
Elbows—Square, Rectangular, Round, Oval.
Pipes Intersecting Spheres.
Egg-end for Tank.
Oblique Pipes.
Oblique Connections.
Measuring Cups.
Square Pans.
Elliptical and Round Pipes Intersecting.
Compound Elbows.
Mitered Mouldings.
Cornices
Match Box.
Tool Box
Mail Box.
Bread Box.
Leader Heads.
Skylights.
Refrigerator.
Gusset Sheet.

Radial Lines.

Funnels.
Ventilator Heads.
Can Covers.
Hand Scoops.
Preserving Funnels.
Dippers.
Waste Paper Baskets.
Standard Measures.
Auto Funnels.
Megaphones.
Reducing Elbows.
Cones and Cylinders Intersecting in Various Positions.
Separators.
Sprinkling Cans.
Pails.
One Piece Cone.
Cans for Filling Automobile Radiators.
Furnace Tops.
Pipes Intersecting Furnace Tops.
Oil Cans.
Elliptical Pans.

Triangulation.

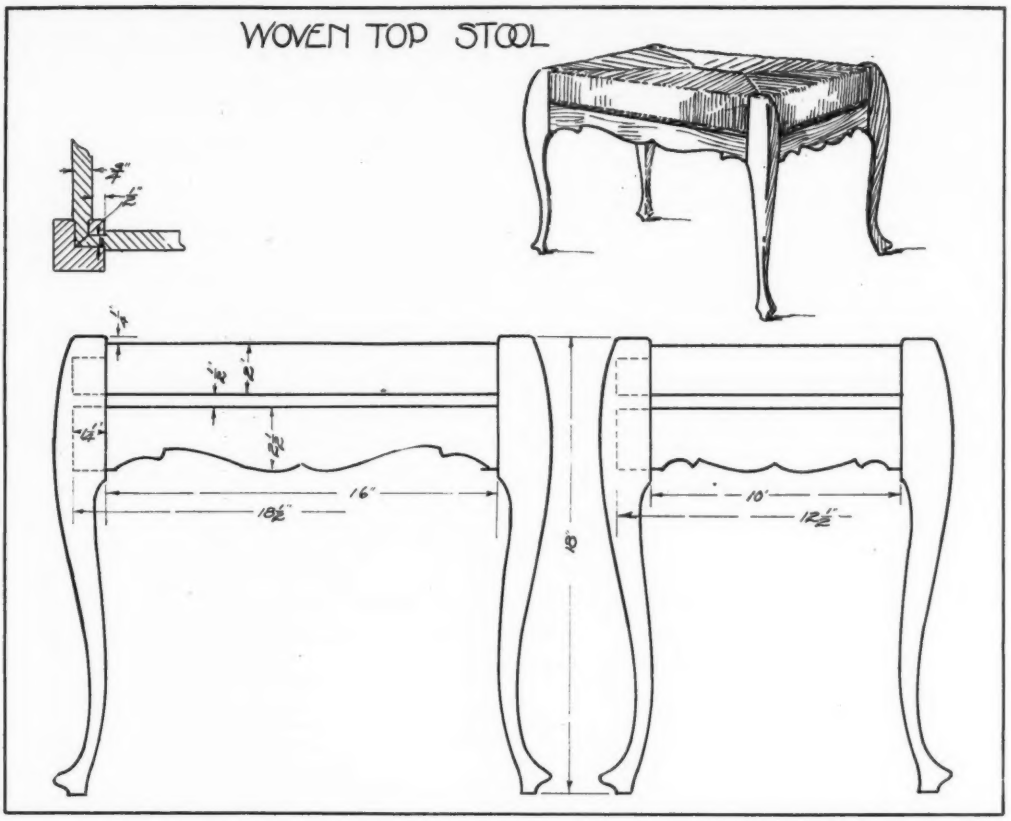
Exhaust Hoods.
Hoppers.
Spray Hoods.
Reducers.
Transition Pieces.
Sink Strainer.
Dust Pans.
Roof Flanges.
Circular and Elliptical Bosses.
Floor Register Boxes.
Furnace Fittings.
Ventilating Cowls for Ships.
Forge Hood.
Connections.
Two and Three-way Branches and Forks.
Chutes.
Transition Elbows.
Helical Elbows.
Helical Conveyors.
Twin Elbows.
Boiler Breechings.
Auto Bodies, Hoods, Cowls, Fenders, Radiator, Shells, Pans.
Locomotive Oil Can.
Transitional Boss.
Cylinder Intersecting an Oblique Cone.
Spiral Inside of Cone.

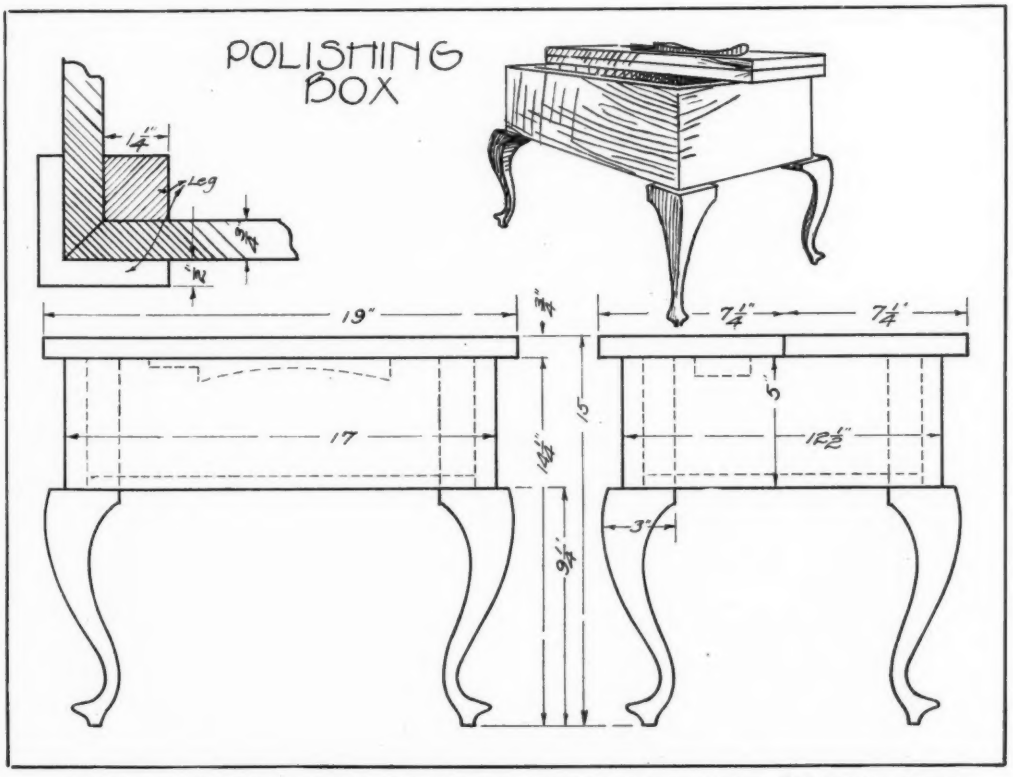
XV. A list of the following problems classified under the three methods of developing surfaces may be found useful:

Points on the best method of designing the forms listed above should be illustrated and discussed.

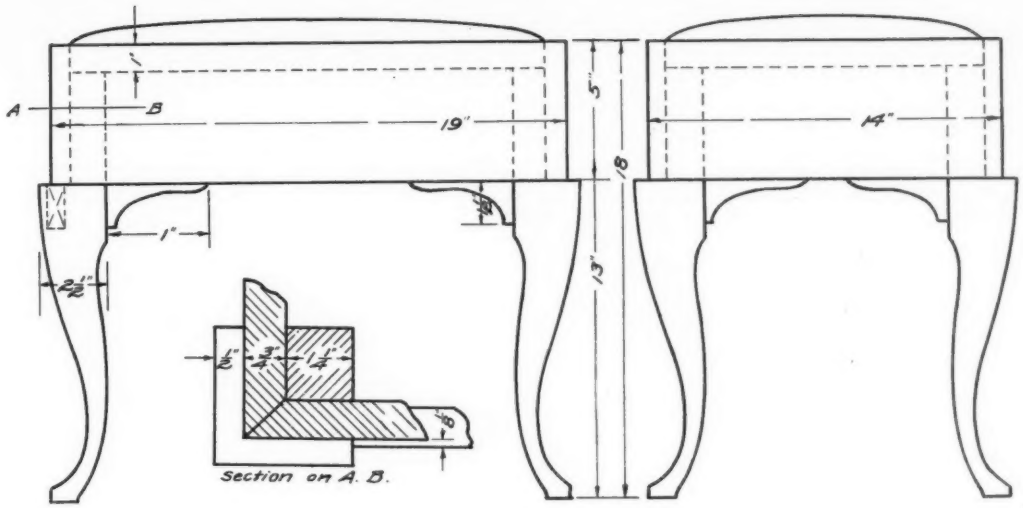
The writer has gone into detail in this outline, not so much for the experienced sheet metal instructor as for the mechanical draftsman—who, in the average town is called upon to teach the subject, and who, as a general rule, is in search of a detailed and definite outline on this subject. However, it is hoped that the experienced man will find many instructive and useful suggestions contained herein.

Evening Industrial Classes. The evening classes of the school of technology at Atlanta, Ga., have added new courses which include armature winding, electrical wiring, blue print reading, chemistry, combustion of fuels, English, Spanish, foremanship training, machine design, testing power plant equipment, valve setting, woodworking, heating and ventilating, highway engineering, structural steel design and concrete design.





PROBLEMS IN FURNITURE DESIGN WORKED OUT BY STUDENTS OF THE NADLER VOCATIONAL SCHOOL.



Problems in Elementary Woodwork and Design

H. H. Todd, Principal Part-Time School and Wm. Nadler Vocational School, Amsterdam, N. Y.

Wood shop teachers who are struggling not only to teach a boy manual dexterity but also to instill a love of the beautiful, find themselves handicapped by the boy's inability to make an article that requires very fine craftsmanship, or one that is very complicated, or a piece not having a rather plain surface. However, it has seemed to me that much of the woodwork as given in our manual training and vocational shops is needlessly severe and plain.

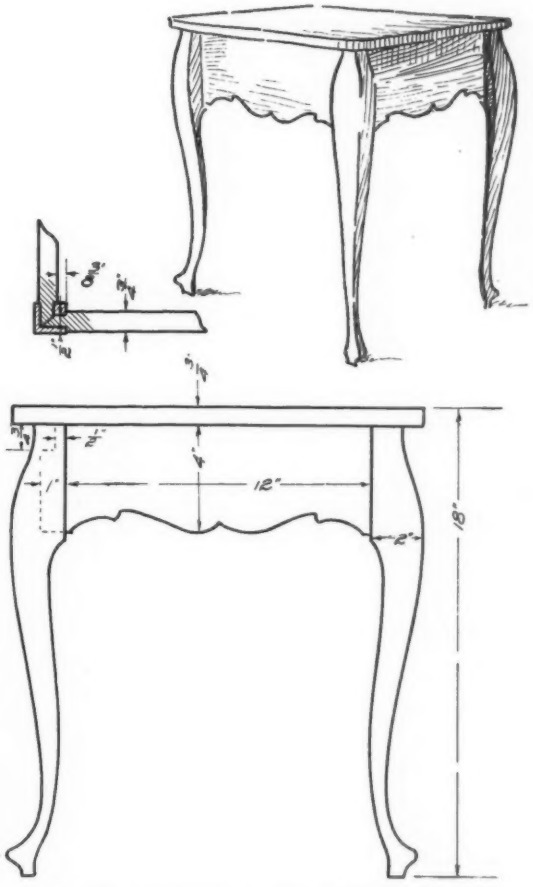
The legs of chairs and tables are large and swollen out of all proportion to the load they must bear, and are so uncompromisingly straight. Three and four inch legs on small sized library tables are not at all uncommon. The legs are made with no taper, and appear to be affected with elephantiasis. Straight line rails do not look as strong as a rail of the same width and thickness, that has a well designed curve.

In most schools we are following the lines of least resistance in designing furniture. Straight lines and plain surfaces also seem easier for pupils to form and finish. Yet in most cases curves are as easy to design, nearly as easy to finish and surely enough more interesting to pay for any added trouble. The following models represent an attempt at breaking away from some of our traditions. We have tried to make our furniture less boxlike.

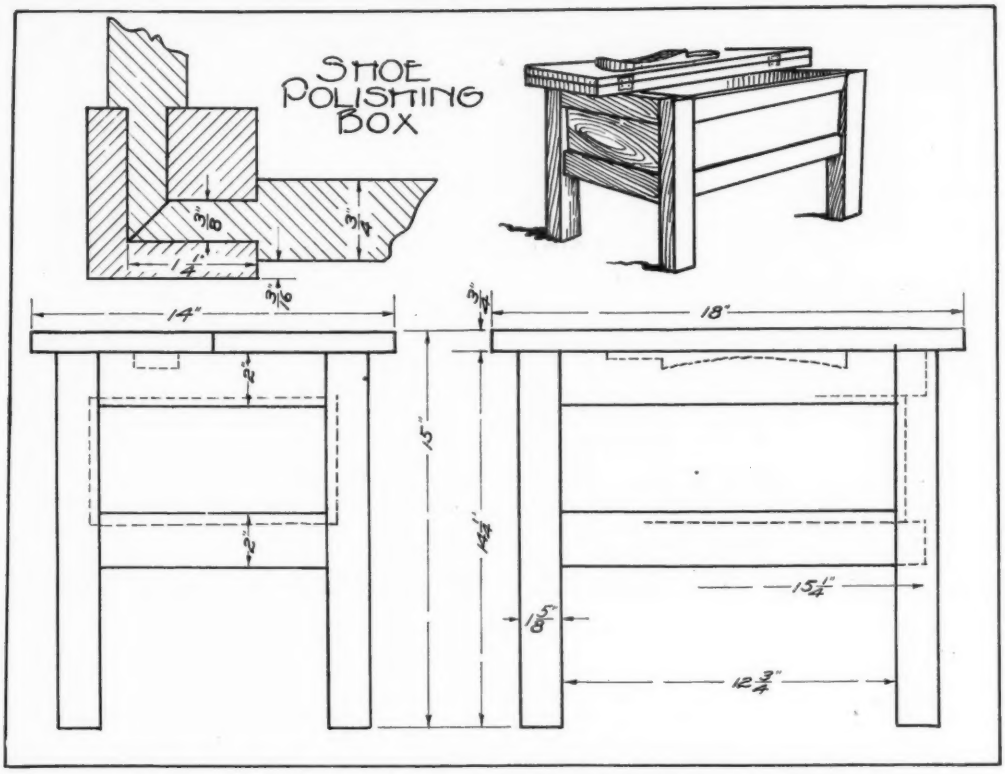
The woven top stool seems to me an exceptionally good example of the possibility of using curved lines to secure interest and beauty. Yet the stool is left simple enough for almost any eighth grade boy to make. An endless number of variations immediately suggest themselves in rail and leg shapes. Or the same idea used in a stand or table with the top let in between the legs might be used.

The top can be treated in several ways, flat wood top, upholstered, or woven with flat reed or rushes.

The polishing boxes are old friends but perhaps the treatment is new. The simplest one is easy enough for most sixth grade boys. The paneled box is the result of our attempts at securing pieces in mortise-and-tenon construction to be made by hand, preliminary to making larger pieces using the same construction with the help of the machines. The parts of this box are small enough so that the first piece of hand mortise-and-tenon work need not always be of the foot stool persuasion, neither does it need to be a practice joint.



A STOOL DESIGNED IN THE AUTHOR'S SCHOOL.



AN INTRODUCTORY PROBLEM IN FURNITURE DESIGN WORKED OUT BY A STUDENT.

In the third case we have again used the curved leg. The sides may be made plain butt-joint, mitred, or dadoed. This style of construction lends itself admirably to the foot stool. The top cannot be treated in the same manner as the previous one but should have a woven or upholstered panel let in between the rails.

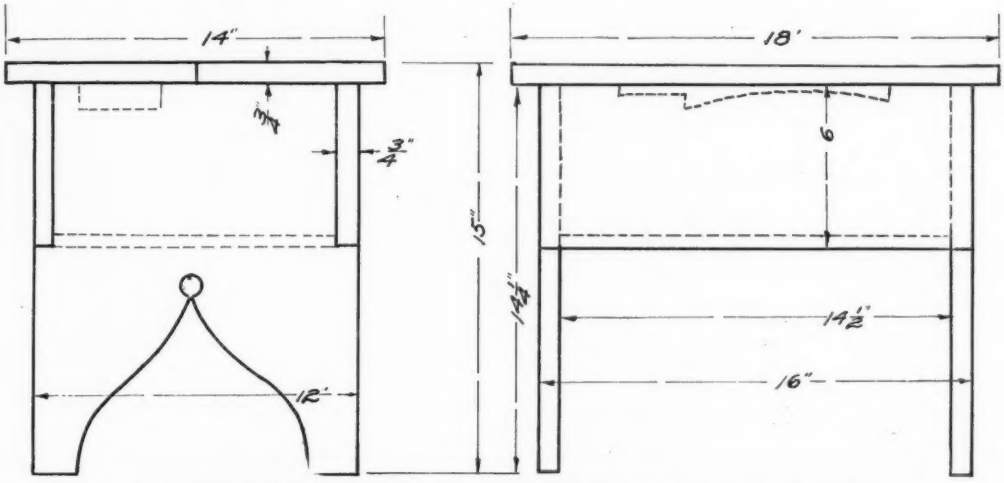
The footstools are very useful if made standard chair height.

The taboret we seem to have always with us but even in this simple project we may introduce new lines and varied joint construction. It will be noticed that the taboret with the octagonal top uses mortise-and-tenon, cross lap, and dado joints. It thus provides fine training in the handwork part of the course and is simple enough for very young pupils. This design is easily subject to many changes.

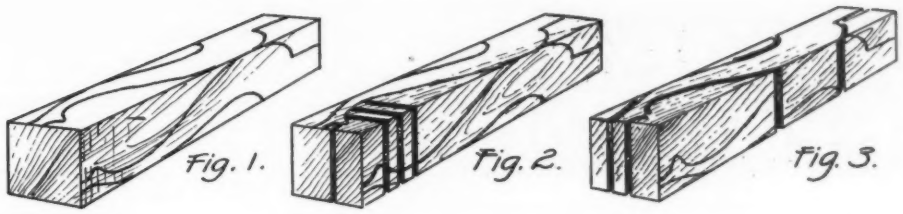
The two designs shown give more stability than the usual taboret.

Forming French Legs.

The method we use in forming French legs is as follows: First, if the design is a new one, the legs are worked out in miniature because it is not possible always to forecast exactly, the results of the combination of curves from the intersecting planes. A design that looks well in profile will frequently turn out to be very awkward in the other views.

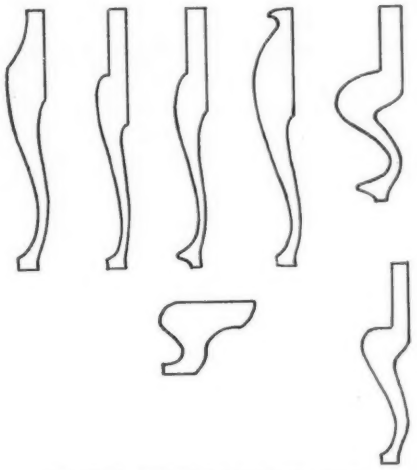


A STUDENT'S SOLUTION OF THE TIME-HONORED SHOE POLISHING STAND PROBLEM.



If the model leg is well proportioned a full size pattern is made in beaver board or bass wood. This is applied as in Fig. 1.

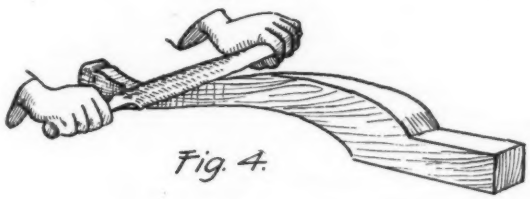
It is essential that the piece be square, but not necessary for it to be to size. Be sure to use a saw that is small enough to follow the curves. If the saw is not narrow enough for this, preliminary cuts may be made, as in Fig. 2.



TYPICAL FORMS OF FRENCH LEGS.

In sawing the first side of the leg, care must be used that the waste pieces be left attached to the main portion by a small bridge, otherwise the pattern on the other face will be lost and also the surface on the saw table for the second side will not be stable. (See Fig. 3.)

About 1/16" is left outside the line after saying in order that the leg may be trued up properly. A spoke shave and wood rasp followed by sand paper leaves the surface in good condition. If the file is turned flatside down and used as indicated in Fig. 4, the saw marks and line qualities are removed rapidly and easily.



HINTS ON TEACHING LETTERING.

Edwin M. Love, Alhambra, Calif.

Like nearly everyone else, many manual training teachers make their difficulties too hard. They like to bring down the "Castle Difficulty" with one huge broadside, forgetting that a well laid series of mines placed in secret would accomplish the result more completely. They vision the problem at hand as a single unit, rather than a composite group of elements that, with a fair amount of ease, can be disposed of one by one.

Now it is well known that the teaching of lettering involves an exposition of the formation and spacing of letters in words and the grouping of words and sentences in pleasing masses. On the other hand, it also means the reduction of letters themselves to component parts, and it is this process that is often badly managed.

If given a chance, boys will teach themselves to make letters. It is an elemental passion in boys to pull things to pieces, not in a spirit of destruction, but merely to see how they run or how they are put together. Evidently an appeal to this basic desire should immediately arouse interest. This forms a correct genesis of analytical thinking.

Suppose that we have a class of fifth or sixth grade boys to interest in the practice of lettering. As rapidly as is consistent with accuracy the instructor sketches the alphabet on the blackboard. If skilfully done, the boys watch with great interest, but in the same breath that they voice admiration of the teacher's skill they admit the hopelessness of their own lack of ability. The task ahead, they are sure, is far beyond their feeble powers. An immediate struggle with pencil and paper would simply confirm the idea; consequently they should not have paper and pencil at hand. It is teacher's inning.

"What letter is the easiest to make?" inquires the teacher.

"I, of course, because it's only a straight line."

"How many other letters have I in them?" continues the instructor.

In the general response that follows 21 letters, A, B, D, E, F, H, I, K, L, M, N, P, R, T, U, V, W, X, Y, and Z are chalked in a row on the board.

"Now what letter with curves is the easiest letter to draw?" asks the teacher and O is voted in unanimously, while the list of derivative letters, B, D, C, G, J, Q, R, S, are listed under those formed from O.

"Are there any other letters to dispose of?" once more the teacher asks, and in a chorus the class shouts that all the letters are used up.

"They're all made of I's and O's," pipes up a little fellow, with an air of having announced a great discovery.

"If we learn how to draw I and O we can make all of the letters," a half-dozen eager boys exclaim at once.

How simple! In ten minutes the alphabet bogey is laid low at the feet of the boys; and best of all they think they did it themselves. Their mental outlook is entirely changed, since the 26 difficult letters they saw at first are seen to be merely the innocent I and O masquerading in other disguises. If, by means of covert whispers, sly winks, and kicks in the shins they are not "wising up" each other on the subject, they are no average group of small boys!

Now they may wander at will with pencil over the expanse of white paper, for a limited time practicing the simple I and O, and afterwards for the interest-stimulating change and variation, combining them in little designs. For each letter should be considered a design in itself, a design to be practiced when the invention of the child is flagging and has served its purpose. And the difficult start has been made, with the boys happily and sensibly moving along a direct route toward proficiency in lettering.

PROBLEMS & PROJECTS

This department aims to present a wide variety of class and shop projects in the Industrial Arts. Successful problems are invited and will be paid for. A brief description of constructed problems, not exceeding 250 words in length, should be accompanied by a good working drawing. The originals of the problems in drawing and design should be sent.

Problems in benchwork, machine shop practice, turning, pattern-making, sewing, millinery, forging, cooking, jewelry, bookbinding, basketry, pottery, leather work, cement work, foundry work, and other lines of industrial-arts work are desired for consideration. The editors will not accept the old hackneyed problems of footstools, taborets, towel holders, etc., which have been made from time immemorial, ad nauseum.

A MACHINE SHOP PROBLEM.

Robert Hutchinson, Crane Technical School, Chicago.

A machine-shop problem with the advantage of requiring very little power equipment is oftentimes desirable due to local conditions.

The wrench shown on the drawing is mainly vise work, a speed drill and lathe being the only machinery really necessary.

The material is ¼ inch cold rolled steel, 2 inches wide, on which the design is laid out and a hack saw used to cut away the unnecessary metal. Filing accurately to the lines, rounding of the end and the handle portion, drilling out and filing the slot for the nut and screw completes this part.

The sliding jaw and straps are now made and all parts are clamped in position while the holes are drilled and countersunk.

Pins are placed in these holes to hold the straps and jaw together while filing the rounded portion of the same.

An ordinary hand die is used by the student in cutting the threads for the screw. A small power threading machine is, however, to be preferred for cutting short lengths of stock from which the screws are made.

Shelby steel tubing of suitable size is used for the nuts. These are tapped, knurled and cut off in the lathe.

The screw is filed flat on each side which keeps it from turning. It is fitted snugly endwise in the slot.

The various parts are now assembled and fitted so as to work properly, then taken apart and each piece polished with emery cloth.

Case hardening of the wearing parts, a final polishing, reassembling, using the pins for rivets for the straps and sliding paw, finishing these parts smoothly with file and emery cloth completes an interesting and practical little problem.

A PHONOGRAPH CABINET.

E. C. Powell, Bowling Green, O.

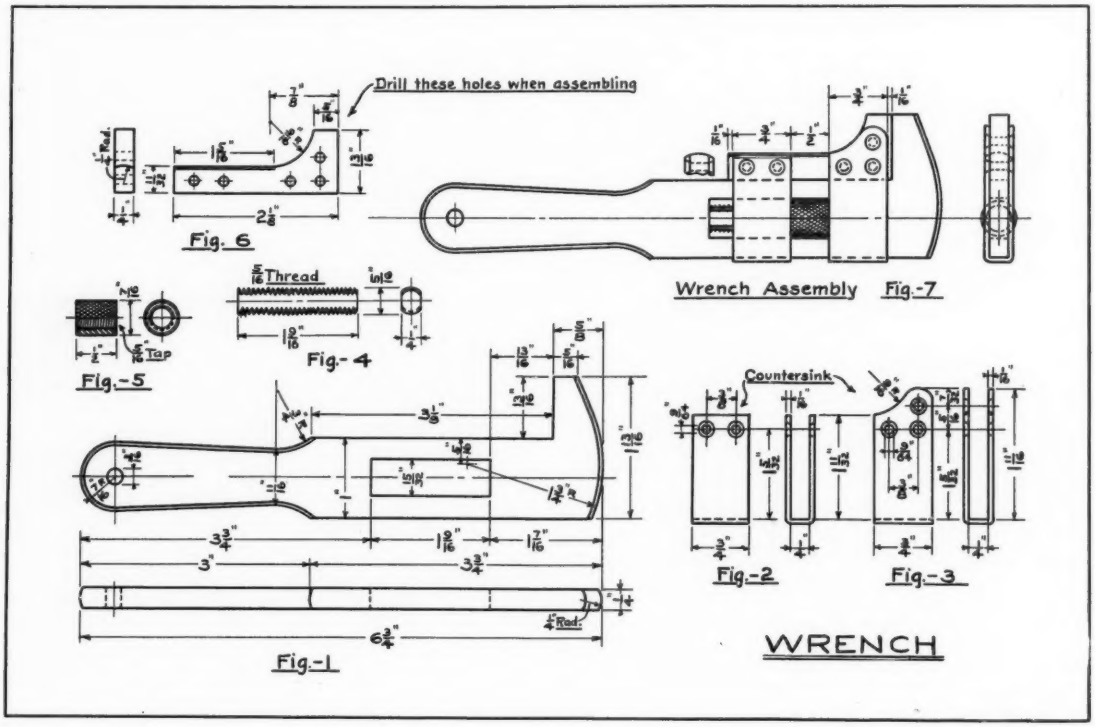
The phonograph cabinet makes a good project for advanced cabinet making. While it is designed for a record cabinet in the left end, this space could be used nicely to house a wireless outfit. If used for this purpose a "bakelite" panel can be fitted in, instead of shelves on any other desired record containers.

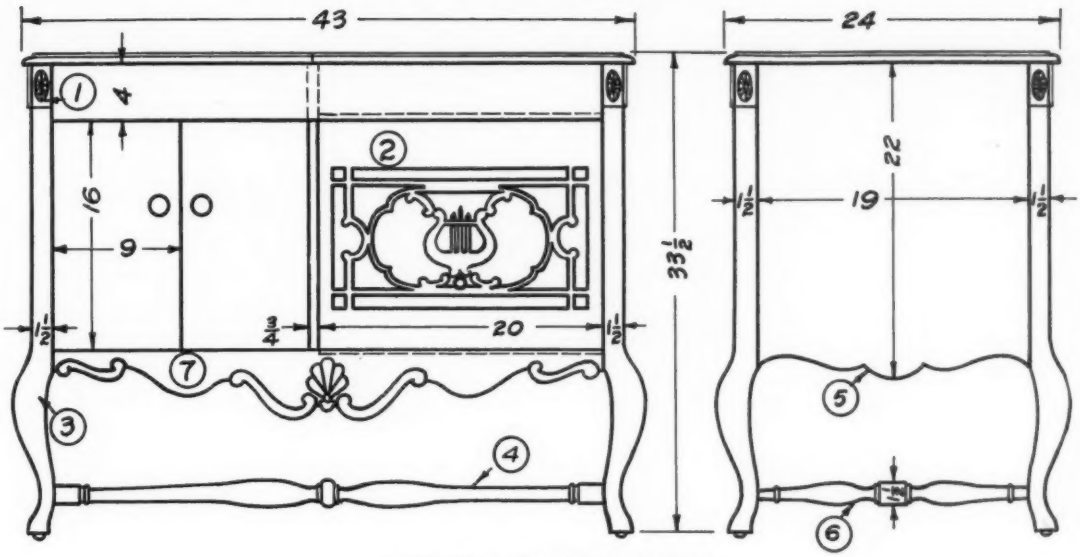
This project should be worked out in walnut or mahogany, since there is too much work on it to be cheapened by inferior materials.

The principal drawing shows the overall dimensions used. These can be varied slightly, to suit the builder. The top should be made as a single piece and the molding put on with a shaper or with a plane. This makes end grain on each end mold, but this can be finished satisfactorily and will take care of its self during expansion.

The size of the motor will have much to do with the overall dimensions. The tone arm and turn-table should be allowed a space 20"x20". The motor board should be placed 4¾" below the top on the right end, for a spring motor, to provide room for the crank at the right end. If an electric motor is used it may be placed in the center, with a record cabinet at each end. This would call for a three piece top and would look slightly better, because it would allow for a more balanced design.

It will be necessary to make templates for each detailed part in order to insure uniformity. These templates will be most serviceable if made of 3/16" wood, full size.





DESIGN FOR A PHONOGRAPH CABINET.

The detailed parts are drawn to insure good templates and simplify dimensions.

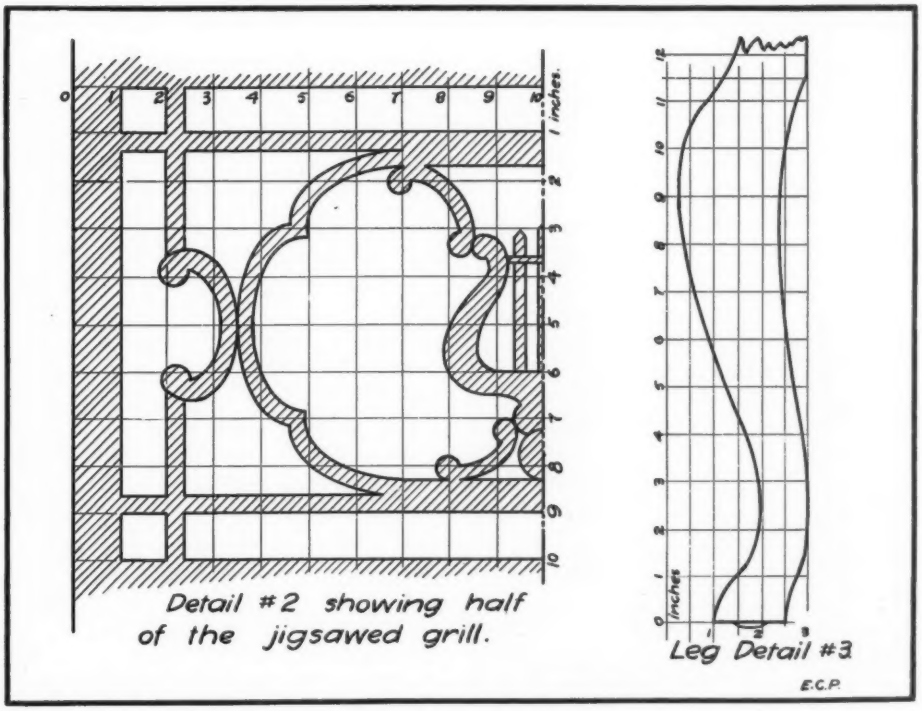
The legs may be made of solid material or may be glued up on 1½" square stock to make the bulge as shown in detail three (3).

Detail No. 2 shows the grill. It should be made of ¼" veneer, with the grain running up and down to match the doors and back panels. It should be drawn full size on a paper template and the centers located with a nailset, through the paper. The large holes can then be bored with an extension bit to 1½" while the ⅜" bit will care for the small ends. Tangents should be drawn as shown and cut out with a jig-, or keyhole saw. The sides can then be rasped and sanded down to a finished edge.

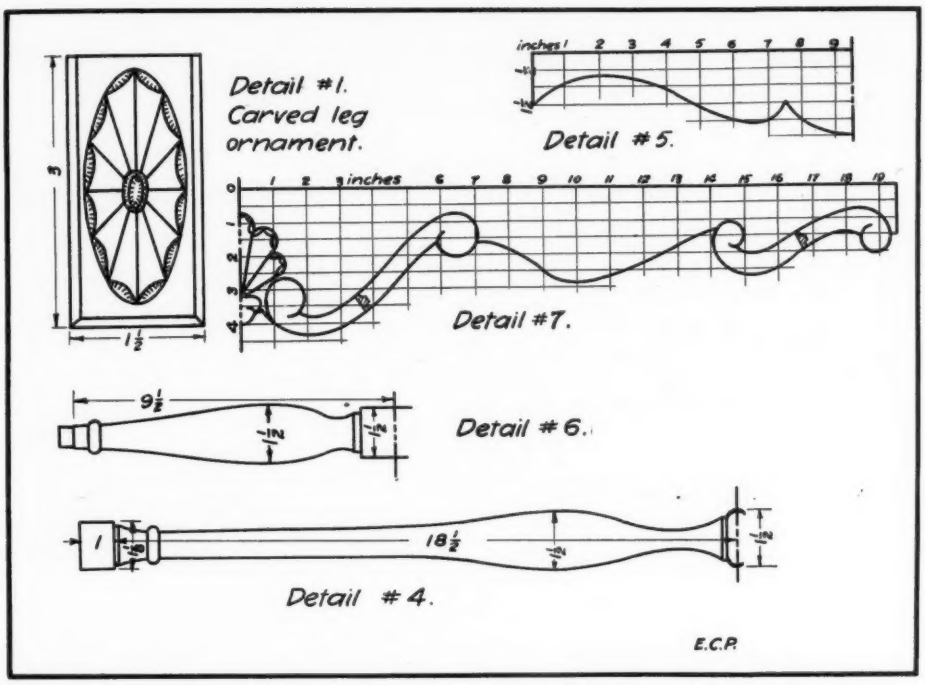
The 1½" holes are 2" from center to center. All openings center to the bottom of the lyre. When finished, it should be fitted into grooves at the top and bottom of the front of the horn chamber. Tone boxes and sound boards can be purchased ready-made, with the motor and other attachments, and are not described.

Detail No. 1 shows the leg ornament beneath the top, drawn full size. The oval design with spider-web carving is particularly effective. The lines can be marked with a veining tool and the ends scooped with a gouge. A raised oval should be left in the middle of the figure. Detail six shows one of the two end rungs.

Detail No. 4 shows the single stretcher which extends between the squares of No. 6. Much of the design and dimensioning is here purposely left to the builder.



DETAILS OF A PHONOGRAPH CABINET.



DETAILS OF A PHONOGRAPH CABINET.

The carving on detail No. 7 is profile work, made out of ¼" material and glued and bradded to its place. If these pieces are bandsawed from ¾" stock and then split, they match readily, and look well. The line and gouge work can be completed when the glue has set and the profile pieces are firmly in place.

The back looks well if made in two paneled sections. It will then be serviceable as a center table, when not in use as a phonograph.

The top section should be hinged and have a drop lock arm. The doors can be made of solid material and held by friction catches. Solid brass hardware lacquered with shellac will look well if black walnut is used.

Fill with a good filler, shellac, and wax or varnish as desired. In the writer's opinion walnut should never be stained, since this destroys the "high points," one of the charms of finished walnut.

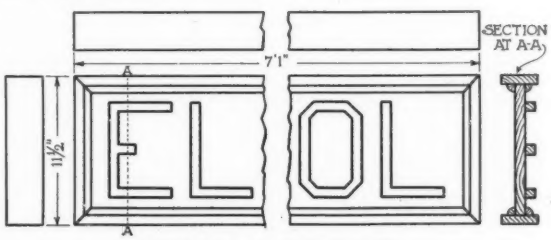
A SCHOOL SIGN.

R. E. Keeler, Eleele, Kauai, T. H.

A school sign adds to the appearance of a school building and also furnishes a good problem for shopwork.

The one shown in the photograph was made by eighth grade pupils of the Eleele School. The letters are raised

THE SIGN AS COMPLETED READY FOR THE FINAL PAINTING.



DETAILS OF A SCHOOL SIGN.

being made of three-quarter inch material, nailed to the background. The letters formed by straight lines are made up of separate pieces set together, while the S, C and O are sawed out of solid blocks with coping saws.

The sign was finished with enamel, the letters being made black and the background white.

The accompanying drawing shows the general make-up of the sign.

TOOL KIT.

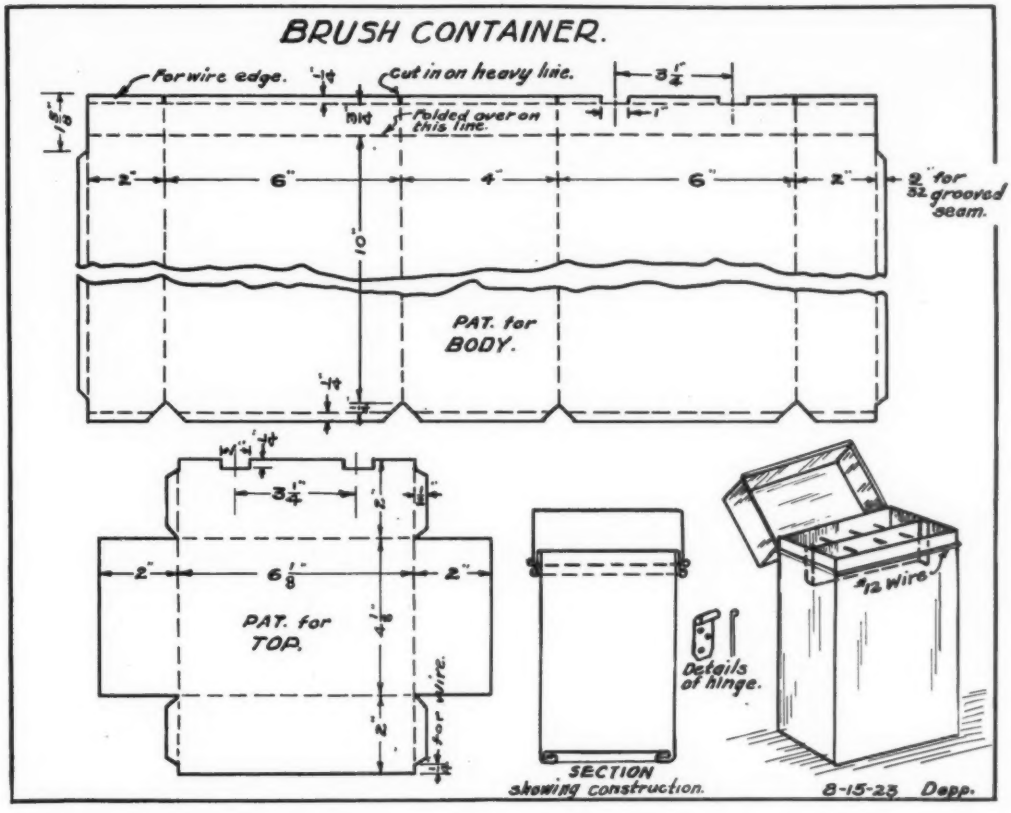
R. L. Welch, Stout Institute, Menomonie, Wis.

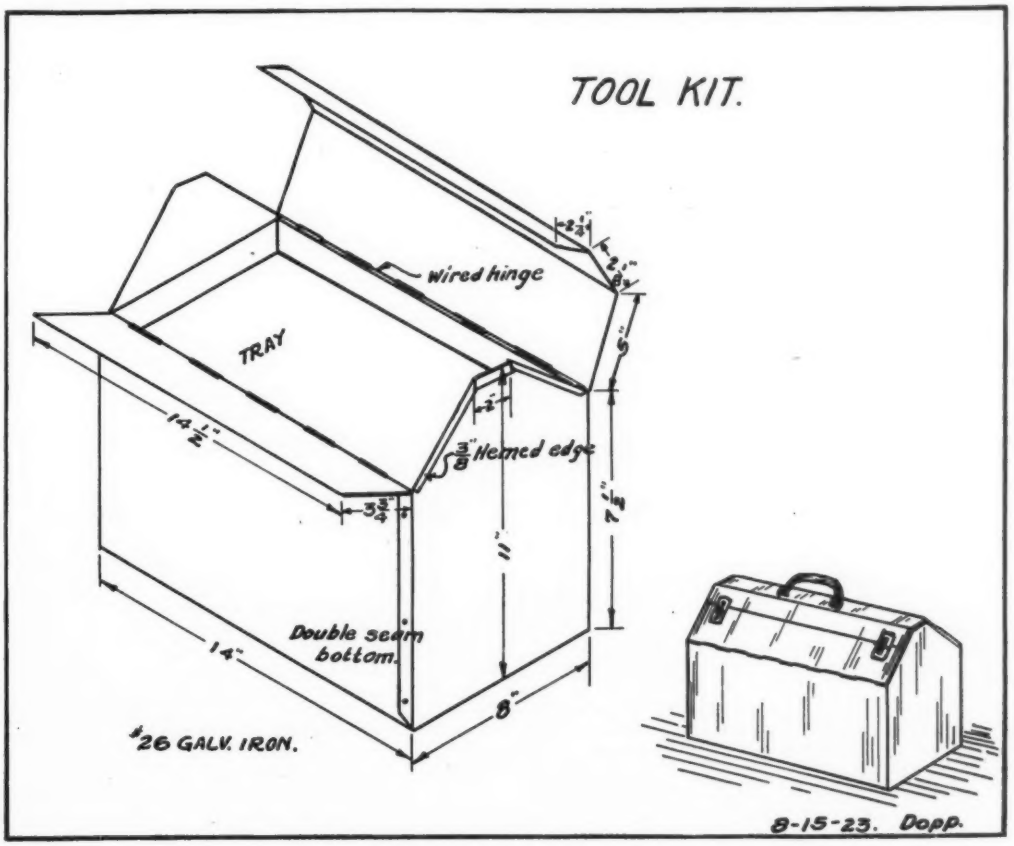
This tool kit is a good problem in rectangular work and is very popular among auto mechanics. It should be made from 22 gauge or 24 gauge black iron, if the kit is to be painted and fitted with a good leather handle and suit case clasps. The hinging in this problem is continuous throughout the length of the kit. The inexperienced student should make a practice hinge of this type before attempting this problem. The allowance is made for the wire to be used in the hinge and one-eighth added, then the wire edge is turned in the folder, the wire placed in, the work run through the wiring machine, and the wire withdrawn. The other part of the hinge is treated likewise. This problem looks particularly well painted with green or drab automobile enamel.

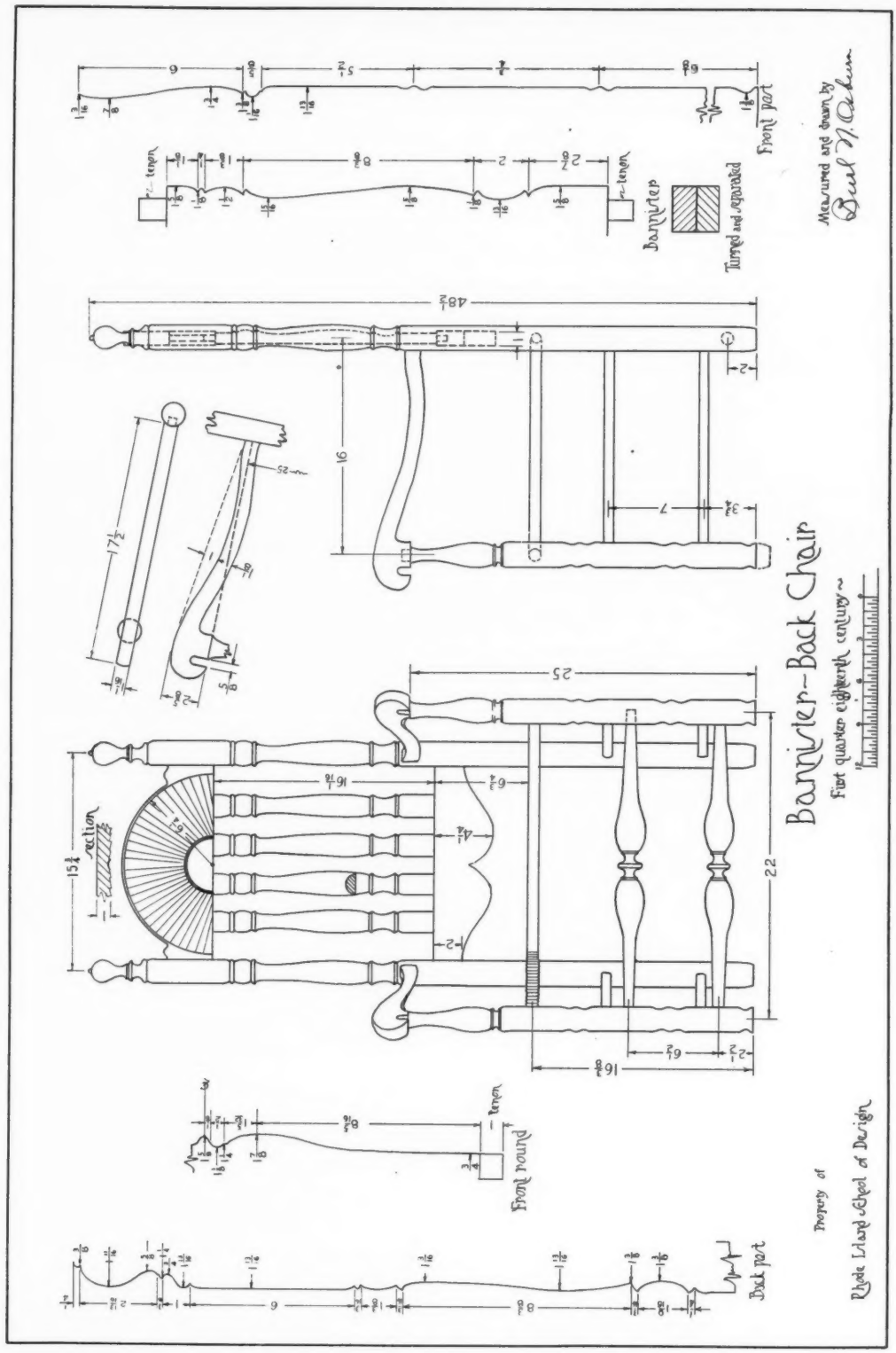
BRUSH CONTAINER.

R. L. Welch, Menomonie, Wis.

The metal brush container makes a good problem in rectangular box work for a sheet metal class and is a handy piece of equipment for the wood finishing department, for the keeping of brushes suspended in turpentine or alcohol without permitting the bristles to touch the bottom of the


BRUSH CONTAINER.
For wire edge.
Cut in on heavy line.
Fold
Folded over on this line.
2"
6"
4"
6"
2"
2/32 for grooved seam.
10"
PAT. for BODY.
3 1/4"
6 1/8"
PAT. for TOP.
for wire.
SECTION showing construction.
Details of hinge.
#12 Wire
8-15-23 Dopp.


TOOL KIT.
Wired hinge
TRAY
14 1/2"
3/8" Hemmed edge
11"
Double seam bottom.
14"
8"
#26 GALV. IRON.
8-15-23. Dopp.



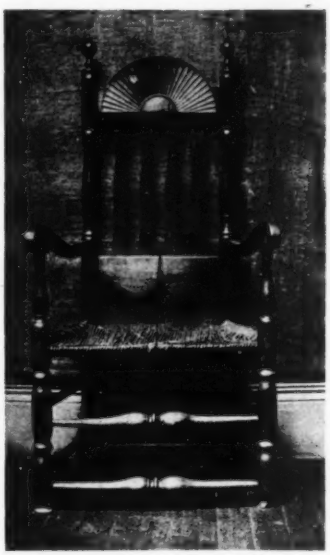
DETAILS OF A BANNISTER BACK CHAIR.

container. Holes are drilled in the handles of the brushes and the brushes are suspended on the wire stubs shown in the picture drawing. This problem should be made of No. 30 gauge galvanized iron. The drawing is practically self-explanatory as to the making of this problem. The difficulty experienced in teaching this problem is the training of the student to do satisfactory hinging. Ill-shaped problems, due to inaccurate laying out, result in the making of ends or sides of unequal lengths. In the making of any number of such problems, it is very satisfactory to buy small inexpensive hinges rather than to make them. In making the cover, there should be about one-eighth inch allowance in length and width at the top so that the lid will not fit too tightly.

BANNISTER BACK CHAIR.

Burl N. Osburn.

The bannister-back chair traces its ancestry to the Flemish chair of the time of Charles II. These were elaborate chairs with high, carved backs, cane seats, and turned or twisted legs. In the hands of the colonial cabinet-maker with his somewhat limited means, these details were altered to plain turnings; the cane and carving disappeared from the backs and were replaced by the ingenious chair-maker first by leather or upholstery, and later by the split bannister.



BANNISTER BACK CHAIR.

The model shown here is unusual in two respects: the use of four bannisters in the back where usually three or five are found; and the remarkable sun-burst at the top.

The construction is very simple; every piece, with the exception of the lower back rail and the two arms, is turned. The sun-burst (turned as a round disk) is turned to a depth equal to that of the border mould, then cut on a diameter, the tenons shaped, and the "rays" cut. These are all flat with the exception of the concave center one. The bannisters echo the shape of the back posts. They are turned two together and separated, then tenons cut on each end. The original seat is of rushes. The wood is maple, stained a soft brown.

STOCK BILL.

Cutting Sizes.

No.	Name	T	W	L
1	sunburst	1⅛	16	16
1	lower back rail	1⅛	4⅜	16
2	back posts	1⅞	1⅞	50
2	front posts	1⅞	1⅞	27
4	bannisters	1	1⅞	18
6	side rounds	1⅛	1⅛	17
1	front round	1⅛	1⅛	24
2	back rounds	1⅛	1⅛	16
1	front round	2	2	14
2	arms	1⅛	2¾	19

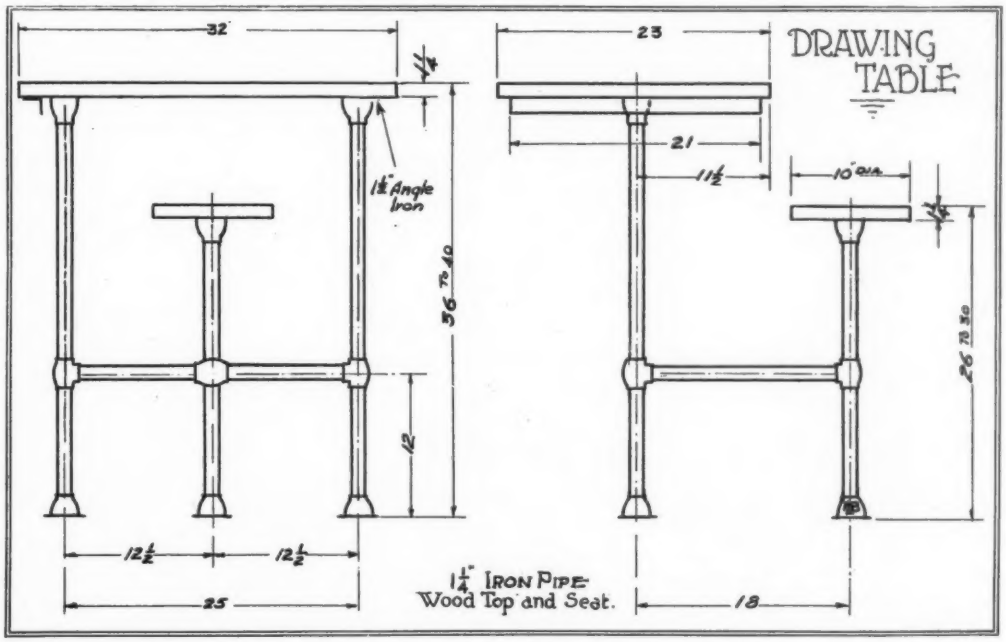
MAKING MECHANICAL DRAWING EQUIPMENT.

J. L. Buehren, Bloom Jr. High School, Cincinnati.

For several years our mechanical drawing was carried on under difficulties. The regular manual training benches with boards placed on cleats cut on a taper, at first provided our only drawing tables. Seats were made by placing boards under the cross members of the benches. Boards and seats were put away after each lesson for the incoming class in woodwork.

Another year saw us in a better lighted room, a regular classroom, but minus chairs and tables. Kitchen tables and stools, two or three boys to a table, served us that year, fighting and still in the ring.

The ordinary drawing tables on the market were out of the question, because of the financial condition of the school board. But necessity is the mother of invention, and accordingly we designed a combination table and seat which placed every student by himself, allowed him to sit or stand as convenient, did away with the noise that goes hand in hand with loose chairs and most necessarily of all, was inexpensive. The tables and stools were built in our school shops. Tops and seats were made in our cabinet shop, while the pipe was cut and threaded in the machine shop.



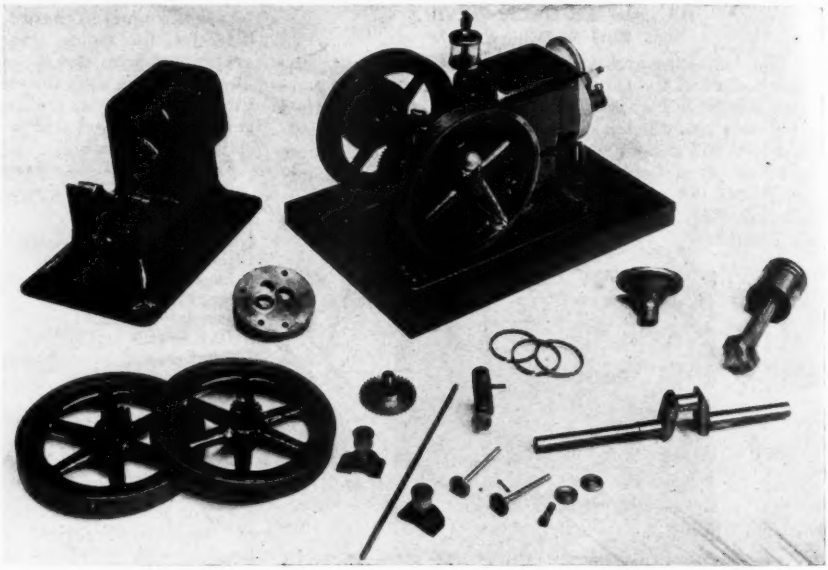
DETAILS OF A DRAWING TABLE.

After more than two years of service, we find that we have tables unequaled in economy of space, noiselessness, individuality, service and cost. The heights were varied and the boys placed accordingly. All the tables are perfectly screwed to the floor by means of the floor flanges which make them stand and serve like the "Rock of Gibraltar."

A LIVE-WIRE MACHINE-SHOP PROJECT.

H. O. Dickert, Central High School, Ypsilanti, Mich.

The accompanying photographic reproduction shows a four-cycle, 2¼" bore by 2½" stroke, water-cooled, stationary gasoline engine; a problem of esteemed interest for any drafting room, pattern shop, foundry and machine shops in manual arts, vocational and industrial schools.



ENGINE MADE IN THE YPSILANTI, MICH., HIGH SCHOOL.

During the present school year we are making sixteen of these engines, and I know of no other mechanical device that will create more interest and enthusiasm on the part of the students and instructor included.

It is an especially valuable problem because there is not a wide-awake American boy today who is not interested in gasoline engines. The cost of the project is but a nominal sum for the castings. By means of his time and hard labor, the boy is producing an engine worth many times the cost of the raw materials. Besides, the boy acquires the combined fundamentals of machine-shop theory and practice which will be invaluable to him educationally and vocationally when entering any commercial shop.

What better method is there of showing him the value of industrial and vocational education and, at the same time, demonstrating to him the important economic principle? Care must be exercised, however, in the making of any project so that the boy not only takes home his highly valued engine, but that the principle, likewise, is driven home to him.

The engine is capable of being put to many uses in its range of power, such as: driving washing machines, cream separators, emery wheels, dynamos, pump jacks, etc. In fact, each engine will be put to as many uses as there are boys in the class, judging from the interest that each and every member of my class is taking.

Particular stress is placed in teaching drafting students the purpose and the function of the parts they are drafting; the stress contained therein; the strength of the materials to be used; arranging the material in an artistic and practical way, and combining economy of material and proportion to give the desired strength. In short, it is desired to give a sufficient number of views, dimension allowances and tolerances necessary to economically produce the project in a practical, mechanical way.

Space will not permit me to analyze the detailed construction of the engine. However, some of its features are as follows: the base of the engine serves as a gas tank, the aluminum connecting rod is centrally connected to the crank shaft which drives a fly wheel at each end, as the photograph designates. The cylinder is completely surrounded by water, giving ample cooling area; the two valves, a mechanical exhaust and an automatic intake, as well as the spark plug are placed in the head of the motor; the speed of the engine is controlled by the fly wheel governor, which in turn is connected to the butterfly in the mixing valve, thus producing a uniform speed at various engine loads.

NEW BOOKS.

Engineering Mathematics.

By Miles A. Keasey, Alfred Kline, D. Allison McIlhatten. Cloth, 342 pages, illustrated. Price, $3.50. Published by P. Blakiston's Son & Co., Philadelphia, Pa.

This book is neither an elaborate college text nor a condensed treatise of the applied type, but a very thorough and technical book of moderate size. It has been developed from the night school work of some twenty instructors of engineering and carries the work from advanced arithmetic through algebra, geometry to plane trigonometry. The geometric and trigonometric principles are developed in close correlation and the algebraic processes are so handled that they are of constant use in solving the advanced problems. The book is teachable, entirely modern and adequate for shorter courses. Complete tables make it entirely self-contained.

Strength of Materials.

By Walter E. Wines. Cloth, 241 pages, illustrated. Published by McGraw-Hill Book Co., New York.

This book is a fundamental text for engineering students and will be found of value for reference and library use. It is addressed particularly to machine designers and structural engineers, and provides not only complete data and a clear explanation of principles, but also a valuable series of problems for study in the laboratory and shop. The work has been tried out in resident and correspondence classes at the University of Wisconsin.

Foundry Work.

By R. E. Wendt. Cloth, 206 pages, illustrated. Price, $2.00. Published by McGraw-Hill Book Company, Inc., New York.

This text is in part of the formal descriptive type and in part of the practical shop-project type. Part One gives the student a thorough grounding in the fundamental principles of foundry work; it describes all the materials, tools, and equipment used; it explains their common uses. Part Two takes up the processes of molding and of casting metal by means of progressive exercises or shop problems. Part Three describes furnaces and cupolas and their use and the mixing and melting of metals. The work is not exhaustive but ample for college engineering or full time trade courses. It is an excellent book for the trade school library.

Construction and Repair Work for the Farm.

By F. Theodore Struck. Cloth, 382 pages, illustrated. Price. $2.90. Houghton Mifflin Co., Boston.

This book outlines a series of practical projects in construction and repair work for secondary course in vocational agriculture. The material has been drawn from the experience of the author and of other teachers and is of the best practical type, showing a wide knowledge of farm conditions and needs. The introductory chapters acquaint the student with materials and tools commonly used and

with tool sharpening. The succeeding chapters illustrate and describe in detail the making of a long series of utilities and equipment for the various branches of farming from vegetable gardening to animal husbandry. The work is chiefly in wood, but a few problems in concrete work are added. The final chapters take up home-made equipment for the farm shop and rope, belt and harness work. The work is well illustrated with working drawings and photographs.

Wood Pattern-Making.

Herbert J. McCaslin. Cloth, 296 pages, illustrated. Published by McGraw-Hill Book Co., Inc., New York.

This book represents the best present-day thought in textbook making for vocational schools. It develops the principles and methods of pattern-making by means of a carefully graded series of problems, explaining step-by-step the necessary operations. Materials, tools and equipment used by the pattern-maker, the molder and the foundryman are taken up in order as the work described requires. So too the elements of molding and of casting metals are duly described so that no requirement of a successful pattern may be overlooked in the student's advancement in the trade. The problems are well graded, typical of ordinary custom shop work and easily within the abilities of the average apprentice or trade school student.

Household Mechanics.

Earl L. Bedell. 32 sheets. Price 55 cents. Manual Arts Press, Peoria, Ill.

The job sheet has been found an effective means for getting the most out of shop work from the standpoint of teaching related information, fundamental principles, correct nomenclature of processes, tools, and materials. For the teacher with large classes it has been a time saver and a ready means of keeping everyone in a class profitably busy.

The present group of job sheets covers a group of problems in construction and repair work such as the average householder may undertake with tools and materials at his command. Each sheet is specific in its listing of tools, procedure materials, and references. Questions on facts to be learned, reference lists and useful means for judging the results are provided.

The jobs are well-graded and within the abilities of upper grade boys.

Sewing Machines.

Rosamond C. Cook. Cloth, 146 pages, illustrated. Price, $1.25, postpaid. Manual Arts Press, Peoria, Ill.

This book explains the mechanism of the leading types of sewing machines and describes their most efficient use for typical classes of work which can be undertaken in the average home. The illustrations are complete and the text is exceptionally clear so that the material is particularly useful for school reference.

N. S. V. E. to Meet at Buffalo December 6th, 7th and 8th.

The National Society for Vocational Education will hold its next annual convention at Buffalo, New York, December 6th, 7th and 8th, 1923. Headquarters will be in the new Hotel Statler.

The local Committee has arranged for trips to various industrial plants in and around Buffalo, as well as a special excursion to Niagara Falls. The Buffalo schools will be open to inspection.

It is expected that special railroad rates will be available.

Advance programs may be had from the Secretary of the National Society for Vocational Education at 140 West 42nd Street, New York City.

AMERICAN EDUCATION WEEK.

The United States bureau of education has set the education week for November 18 to 24. It urges upon school authorities to call citizens' meetings at which the subjects of school finance, taxation, building and equipment, playgrounds and recreation centers are to be discussed. In a circular issued it provides suggestions for poster headings, subjects for speeches, plays, pageants and stories.

The days of the week are designed as follows: Sunday, For God and Country; Monday, American Constitution; Tuesday, Patriotism; Wednesday, School and Teacher; Thursday, Illiteracy; Friday, Community; Saturday, Physical Education.

THE SUBJECT OF ART EXHIBITIONS.

Superintendent R. W. Potwin writes in the Kansas Teacher on the "Art Appreciation in McPherson" in which he points out the essentials in art propaganda. He sums up his conclusions on art exhibits as follows:

"Schools starting art exhibitions will not find before them easy roads to glory. People will not appreciate modern art until they have seen the pictures repeatedly and catch the idea the artist wishes to portray. To make an exhibit a success it must be held year after year, until people accept it as an institution. It must weather many discouraging circumstances but in the end it will win out. An artist may portray a beautiful sunset and when it is complete the causual observer will state that it never appeared that way to him. The art lover will only wish that he could see it in that way. A true artist endeavors to eliminate the ugly from life and show only the beautiful. He may even find beauty in ugly surroundings. Do not more of us need to catch the artist spirit? How much happier men and women could be if they were trained to eliminate the ugly things of life and see as does the artist—only the beauty of God's great universe."

APPLIED DESIGN PROJECTS FROM MANUAL TRAINING TEACHERS' CLASS WORKING FOR HIGH SCHOOL TEACHERS' DIPLOMA, NORMAL SCHOOL, BRITISH COLUMBIA, CANADA.

NOW ARE THERE ANY QUESTIONS ?

Refinishing School Desks.

378. Q: We have two thousand old type school desks made of various woods and having various finishes which we are going to dip and remove all finish, if possible, and wish to stain a walnut color and refinish. What stain can we use to feel confident of a uniformly even color?—R. L. S.

A: First, remove all old finish by vat dipping in an Oaktite compound or varnish remover and after careful washing and drying, the tops particularly should be brought down to a clean surface by a careful planing and sandpapering.

The woodwork may then be given a coat of solution of Universal Brown Water Stain No. 200 at the rate of 4 oz. per gallon. This should be allowed to dry over night and may be followed by a sizing coat of orange shellac, made from stock material cut at the rate of 4 pounds of gum per gallon of alcohol, reduced with three volumes of denatured alcohol. This should be allowed to dry until hard, sanded clean with a split 6-0 garnet paper, dusted off and allowing one week between coats.

We believe that the Universal Brown will give you the satisfaction necessary for a good job since we have found that white pine and mahogany in veneered frames, for instance, take a matched color when stained with this material.

It might be of interest to know that the Department at Bakersfield, Calif., has given us repeated orders for this material in the past.—**Ralph G. Waring.**

Model Aeroplane Building.

379. Q: I should like a list of books on model aeroplane building.

A: The following titles are helpful:

Collins' Book of Model Aeroplanes, $2, Century Co., New York; **Cavanaugh's Model Aeroplanes and Their Motors**, $1, Moffat, Yard & Co., New York; **Collins' Boys' Aeroplane Book**, $1.50, F. A. Stokes Co., New York; **Hubbard & Turner's Boys' Book of Aeroplanes**, $1.75, Munn & Co., New York; **Maynard's Building and Flying an Aeroplane**, $1, Munn & Co., New York.

Problems for the Middle Grades.

380. Q: I should like a book for the seventh, eighth and ninth grades, similar to the book entitled "Industrial Work for the Middle Grades."—R. R. M.

A: The following books will be helpful in outlining work for these grades:

Moore's Manual Training Toys for the Workshop, $1, Manual Arts Press, Peoria, Ill.; Marten's Manual Training-Play Problems, $1.25, Macmillan Co., New York; Burton's Shop Problems, $1, Ginn & Co., Boston; Blackburn's Boy Activity Problems, $2, Manual Arts Press, Peoria, Ill.; Vitz's Problems in Elementary Woodwork, $1.25, Southern Publishing Co., Dallas, Tex.; Polkinghorne's Toy Making in School and Home, $2, Hubbell-Leavens Co., New York; Baxter's Toy Craft, $1.30, Bruce, Milwaukee; Kunou's American School Toys, $1.25, Bruce, Milwaukee; Lemos' Color Cement Handicraft, $5, Davis Press, Worcester, Mass.; Campbell's Practical Concrete Work for the School and Home, $1.50, Manual Arts Press; Fallen's How to Make Concrete Garden Furniture, $1.50, Manual Arts Press; Manual Training Course in Concrete, $0.25, Association of Portland Cement Manfgrs., 111 W. Washington St., Chicago; Roehl's Problems in Carpentry, $1, Webb Publishing Co., St. Paul, Minn.; Meloy's Progressive Carpentry, $1, U. P. C. Book Co., New York; Hall and Buck's Handicrafts for the Handicapped, $1.25, Moffat, Yard & Co., New York; Winslow's Elementary Industrial Arts, $1.20, Macmillan, New York; Hall's Handicraft for Handy Boys, $1.25, Lothrop, Lee & Shepard, Boston; Hall's Home Made Games and Equipment, $2.50, Lothrop, Lee & Shepard, Boston; Adam's Outdoor Book for Boys, $1.75, Harper Bros., New York; Thatcher's Making Tin Can Toys, $1.50, J. B. Lippincott Co., Philadelphia; Williams' Tin-Can Toys and How to Make Them, $2.50, C. Williams, St. Louis, Mo.; Bean's Bookbinding for Beginners, $1.50, Davis Press, Worcester, Mass.; Hague's Textbook of Printing Occupations, $1, Bruce, Milwaukee; Stilwell's School Printshop, $1, Rand, McNally Co., Chicago; Henry's Printing, $1.50, John Wiley Co., New York; Loomis' Progressive Exercises in Typography, $1, Taylor Holden Co., Springfield, Mass.

Advanced Architectural Drawing Texts.

386. Q: Please send on approval one of the best textbooks you have on advanced architectural drawing. Some of the students are capable of doing college work.—J. L. S.

A: The following texts may prove suggestive in making a selection of texts suitable for your students:

Architectural Drafting, Greenberg & Howe, $1.50, John Wiley, New York; **Architectural Drawing**, Edminster, $2. W. P. C. Book Co., New York; **Architectural Drawing for High Schools**, Windoes and Campbell, $1.50, Webb Publishing Co., St. Paul, Minn.; **Practical Lessons in Architectural Drawing**, Tuthill, $2.50, Wm. T. Comstock Co., New York; **Structural Drawing**, Edminster, $2.50, Periodical Publishing Co., Grand Rapids, Mich.; **Drawing for Builders**, Dale, $1.50, John Wiley, New York; **Principles of Architectural Design**, Marks, $4.50, Wm. T. Comstock Co., New York.

PRACTICAL ARTS FOR BOYS.

Chas. A. Kunou, Supervisor Manual Training, Los Angeles, Calif.

Distinction must be made between those courses that a boy takes by way of preparing himself for a specific vocation, and those other courses which involve or deal with productive industry as a means of **general training**, and which are consciously **not** training the boy for his vocation. Here we are dealing only with the latter courses, which we shall call the practical arts courses.

The practical arts courses for boys—Agriculture, Mechanical Arts, Mechanical Drawing, Printing, etc.—are not vocational. Neither are they prevocational, in the sense that any one of them taken is the first step toward his later vocational training. They are prevocational in about the same sense that Arithmetic, Science, or Geography are prevocational. They are portions of the boys' **general training.**

This is not to say that they are not important. The general training is certainly as important as the vocational. These courses do look toward **work**; but it is the wide range of unspecialized activities for which one bears responsibility to himself and family.

It appears that the basal objectives of the general practical arts training for boys are about as follows:

1. Ability to perform unspecialized activities about the house, basement, garage, yard, garden, motor-car, etc.
2. Ability as consumer to judge the qualities and values of the products of specialized occupations.
3. Ability, disposition and habit of **observation** and **reading** of things in the world of productive industry as enjoyable and fruitful leisure occupations.
4. A proportioned intellectual apprehension of the world of productive industry; of the specialized occupational groups which compose it; and of tools, machines, raw materials, processes, products, etc., involved. Ability to think in terms of the realities.
5. Ability to choose one's vocation.
6. A disposition and habit of being up and doing, independent, active and positive, in one's home life, and in one's affairs in general; not dependent upon others, passive and negative.
7. A disposition and habit of holding one's practical labors to reasonably high standards of performance; of always doing one's best. Dislike of things careless, faulty, incomplete, etc. (This must be interpreted in terms of the conditions. The general practical arts courses are not designed to develop the high degrees of skill necessary for the well-trained vocational workers.)

In the teachers' papers, there was some tendency to go beyond these last two objectives and to set up the entirely general virtues of honesty, accuracy, sincerity, truthfulness, etc., as general discipline objectives. It is probable, however, that objectives 6 and 7 go far enough in the direction of general discipline. If they are sufficiently attained, then probably as much has been done as the practical arts can do in achieving those still more general virtues.

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Dorchester High School, Boston, Mass.

Better work of the craftsmen of tomorrow is begun today in the school workshop. There, standards must be high, for both instruction and tools. Disston Saws, Tools, and Files are the necessary supplement to the teacher's efforts. Their use forms a habit which means better work in the next generation.

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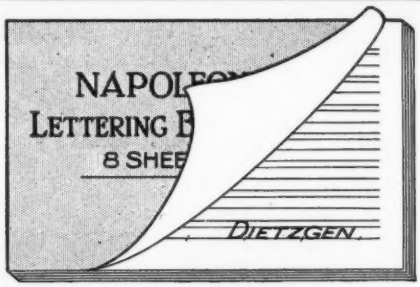

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NEWS AND NOTES.

New Shops. The school board of Visalia, Calif., has completed the erection of a group of buildings which includes shops for automobile mechanics, forging and wood work. Additions have been built for the science building and the domestic arts building.

Domestic Science Course. A course in domestic science has been introduced in the high school at Seymour, Calif., with the opening of the school year. The course is for all freshmen girls who do not take the college preparatory work. New equipment for the work has been installed at a cost of $2,000.

Compulsory Continuation School Laws. The suggestion that the compulsory continuation schools be extended is not favored by Arthur S. Somers, chairman of the budget committee of the New York board of education. He holds that certain legislation is necessary in order to make the operation of the present law "less burdensome financially to the municipality and less burdensome economically to its inhabitants."

"**Both the employers** and the worker's organization," says L. A. Wilson, director of vocational and extension education of the New York state department, "will heartily support any extension of vocational education."

"The unions have always been partial to public education, but fearful of instruction devices controlled by employers," he said. "As a result labor organizations are most progressive in educational matters and have often been instrumental in getting appropriations for schools from the legislature.

"Employers realize that success in industry depends upon the ability to recruit trained workers. Everywhere efforts are made to organize sources of supply of skilled labor."

At Cleveland, O., it is contemplated to begin classes in carpentry and plastering and increase classes in bricklaying. The increased attendance in the continuation schools of New York City this fall is 4,000, making a total attendance of 25,000.

Mechanical Drawing and Textile Designing. The New York evening high school offers a course in mechanical drawing arranged to meet the requirements of the apprentice, mechanic or industrial worker. The course also aims to meet the needs of those who wish to become a draughtsman or engineer.

Textile Course. The New York textile high school has introduced an elementary course in textile designing. It includes work on cotton, woolen, worsteds and silk, base fibers and hair fibers. The fibers are taken from raw stock to finished yarn and cloth and the course is provided to a great degree by actual samples thereby enabling students to learn much more readily.

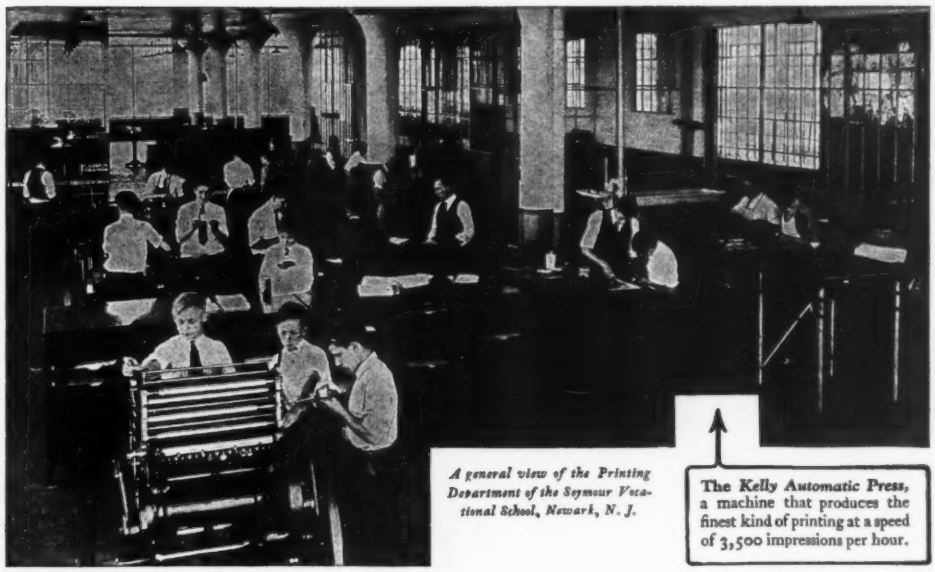
The designing in the course includes the following weaves: Plain, twill, satin, ribs, tricotine, whipcord, skip swill, plain and fancy baskets and all weaves that are used for single cloth fabrics.

The analyzing in the course includes: Textures, warp or filing, reed widths, takeups, yards and ounces per yard of goods and of warp and filling. Problems that are practicable are also given.

Trade School for Workers Only. In a radio talk, Morris E. Siegel, director of the evening and continuation schools of New York City announced that the evening trade schools are not open to beginners. He said: 'The objects of the evening trade schools are to improve and 'up grade' the quality and skill of mechanics and artisans. Those who are not working at the trade in which they seek instruction are not qualified for admission to the evening trade school. No courses are given for those who desire to learn a new trade. Such persons must first find employment at the selected occupation and then they will be admitted. The object is to make better workers, help learners to become journeymen workers, and journeymen to become foremen and superintendents.

Automobile Mechanics. A class for the training of operators and mechanicians of automobiles has been established at the Watt School, Pittsburgh, Pa. Mr. McDonald is the instructor. Junior high school work in industrial arts has been inaugurated in the Gladstone, Perry and Langley Schools.

Occupy New Building. The domestic arts and manual arts departments at Somerville, N. J., have occupied their allotted space in the new high school. The building which cost $250,000 is provided with full equipment for the teaching of these special subjects. The new equipment includes a saw table and a hollow chisel mortiser for the manual arts department.



A general view of the Printing Department of the Seymour Vocational School, Newark, N. J.

The Kelly Automatic Press, a machine that produces the finest kind of printing at a speed of 3,500 impressions per hour.

Printing + Interest = Education

THE PRINT SHOP OF THE SEYMOUR VOCATIONAL SCHOOL, NEWARK, N. J., is not shown for the sole purpose of showing you the equipment, although you are probably interested in such equipment, but there is a greater significance in the picture. Note the interest of these future printers in their work. So great that not a boy even looked at the camera. They are printing their school paper, a beautiful twenty-four page booklet.

Boys, the sizes and ages shown, are not interested in a subject that doesn't appeal to them. Printing fascinates most boys. It teaches them the use of punctuation marks, the making of proper margins, the use of good English, correct spelling, capitalization, and indention in an accurate manner.

School Printing Outfits are inexpensive. They are designed for manual training, pre-vocational, vocational, trade, journalistic laboratory, and the four-activities-in-one-room types of instruction. The smallest school communities and all other types of schools to the the largest universities are installing printing.

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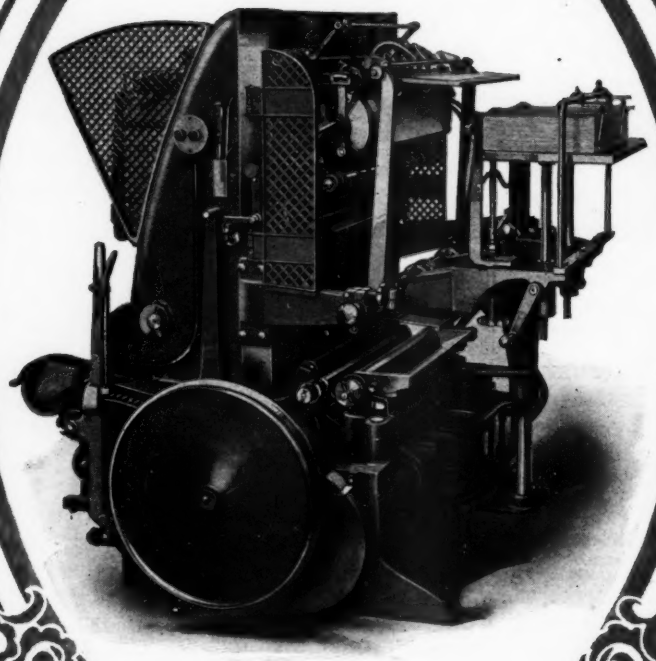

Inside Chase Measurement, 13¾ x 19¾
Type matter locked in chase, 12¼ x 19
Largest sheet which can be delivered, 12½ x 19
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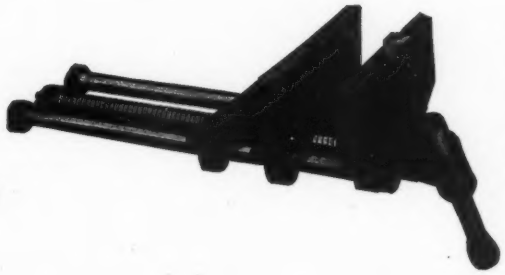

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Enlarge Space for Trade Teaching. The Westfield Boys' Trade School, at Westfield, Mass., has opened its thirteenth year with greatly enlarged quarters. The school has a capacity enrollment and a large waiting list. Among the trades taught are machine shop practice, toolmaking, pattern-making and drafting. A course in electricity is planned for next year.

Install Machine Shop Equipment. A portable building just erected at Michigan City, Ind., houses the machine shop equipment. Mr. L. R. Coburn has been appointed to take charge of this work. The automobile department has been enlarged and placed in charge of Mr. C. Sweet.

Occupy New Building. The shop, cooking and domestic art rooms at Middletown, N. Y., have occupied their special rooms in the new grammar school which has just been completed. Mr. J. A. Bellfield has charge of the shop, Miss Dorothy Baker of the domestic art department and Miss Hazel Crill of the domestic science department.

Automobile Classes Operate on New Plan. At Evansville, Ind., the automobile repair classes are operating on a new plan which has recently been put into practice. Under the plan one teacher teaches straight shop practice in a shop especially equipped for the repair of all types of cars; a special teacher of related subjects is also employed, and the work is done with the aid of large charts illustrating the different parts of a car, special textbooks, blackboards, and appliances for demonstrations and lectures. The work is conducted during one-week periods, and the teachers exchange classes at the beginning of each week. The department has 41 charts of large size, mounted on beaverboard, framed and ready for use.

A course in bricklaying has been introduced for the first time this year. The work is in charge of one teacher at present but more instructors will be provided as the demand arises for this type of instruction. Mr. J. H. Peters is director of all vocational work in the schools.

Printing Department Enlarged. The printing department at Richmond, Ind., has been moved to larger quarters in the Morton High School. The change permits of further expansion in the way of space and equipment which have been badly needed. A large part of the printing for the school system is turned out in the school printshop.

New Rooms for Special Departments. The metal-working, wood working and drafting departments have occupied their new quarters in the Julia Test Junior High School recently completed at Richmond, Ind. Cooking and sewing rooms have also been provided for the girls' departments.

In the general metal shop, the boys are offered work in sheet metal, elementary forging, machine shop practice, electricity, and possibly molding later on. Mr. L. E. Spink is the instructor.

In the general wood working shop, the boys are offered work in home mechanics, cabinet making, pattern making and carpentry. Mr. W. E. Osmun is instructor.

Industrial Work for Colored Pupils. At Jonesboro, Ark., a three-story building for the colored children has been erected. The building is equipped for literary and industrial work and the school is open to all colored children in the county. Mr. D. W. Hughes is principal of the school and director of the industrial work.

Manual Training Department Enlarged. The department at St. John, N. B., Canada, has been enlarged this year with the addition of another room in West St. John. The room accommodates the pupils of grades seven and eight who formerly took their training at the Central School.

Junior High School Courses. At Washington, D. C., four new junior high schools have been opened, of which three are for white pupils and one for colored pupils. The course of training comprises benchwork, pattern making, printing, freehand and mechanical drawing, domestic science and domestic art. The transfer of these seventh and eighth grade boys to the junior high schools makes possible additional shop facilities for sixth grade boys.

At the Smallwood Manual Training School, a course in painting and decorating has been inaugurated. This course has been organized and conducted with the co-operation of the Master Painters and Decorators Association.

Two Shops Opened. New foundry and sheet metal shops will be opened in the boys' vocational school at Newark, N. J., on January first. An appropriation of $15,000 has been made for the purchase of new equipment.

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Coping-Saws—Nickel frame, wire and wooden handle grades.
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Building Trades School. The building trades school which has been in operation at Newark, N. J., for the past year, has opened the new year with classes in house construction and masonry. It is planned to add further departments as soon as the money is available.

Trade Training and Apprenticeship. The York high school at York, Pa., has an enrollment of 1,500 students. Of these students, there are one hundred more boys than girls. In the industrial department, 202 boys are serving apprenticeships on the cooperative plan, while 138 are undergoing trade training, looking toward an apprenticeship indenture at the close of the school year.

Study Part-Time Cooperative School. A committee from the Lancaster, Pa., school board and manufacturers' association recently visited the part-time cooperative school at York, Pa. The committee in its visit sought information for the establishment of a similar type of training in the schools of Lancaster, Pa.

Industrial Work Extended and Developed. Under the direction of Principal L. R. Johnston, the high school at High Point, N. C., has reached new ideals. The work in mechanical drawing and woodwork is conducted with a view of making manual training work a feature of educational value and to develop the ability of thinking in three dimensions and training in creative imagination. The work has been so arranged that pupils may recite once each week using specially selected books for the purpose.

Art metal work was inaugurated in the department last year and forging has been introduced for the present year. It is planned later to establish a machine shop department similar to the wood working department. A printing department is already in operation.

Almost invariably the pupil is provided with a sample, or a working drawing of the project in hand, which has been deemed the most successful way of teaching accuracy and a knowledge of the truth. Information sent by manufacturers and local concerns is distributed among the students as a means of educational value.

During the last year seventy pupils out of a total of 220 pupils were enrolled in this work. They made, in all, about 359 articles, including tables, radio cabinets, cedar chests, cabinet files, candle-sticks, porch lamps and necktie racks. In mechanical drawing, the pupils prepared about 59 plates, beginning with lettering, dimensioning sections, revolutions up to perspective, and a few in architectural and commercial design.

During the last week of school, it has been customary to have an exhibit and sale of some of the work of the department. Two prizes are given, one to the best exhibiter, and the other to the boy who has given evidence of the greatest loyalty and devotion to the cause of industrial education.

Household Mechanics. Household mechanics is offered this year in the seventh grades of the schools at Detroit, Mich. The course which was added to the curricula a year ago, has proven so successful that it is now extended over a year instead of a semester.

Art and Drawing Exhibits. For the first time the schools of Royal Oak, Mich., exhibited the work of the schools in September, at the Michigan State Fair, held in Detroit. The exhibits were principally from the art and mechanical drawing departments.

Vocational Departments. A vocational all-day department has been established in the high school at Huntington, Ind. The classes have capacity enrollments and are doing some excellent work. Mr. F. C. Mahoney is instructor in vocational subjects, under the direction of Mr. W. S. Shock, supervisor.

Industrial Courses. Home making and industrial courses are offered this year in the new junior high school at Raleigh, N. C. The industrial work for boys includes electrical work, sheet metal work, woodwork, typewriting and printing. There are about 300 boys enrolled in this department giving three and one-half hours of time to this work.

Sheet Metal Work Installed. A complete installation of sheet metal equipment has been made in the high school at Bloomington, Ill. The work will be begun at the opening of the next semester, with Mr. S. Bloomquist as instructor.

Industrial Work for Colored Pupils. The Stowe School at Cincinnati, O., offers courses in sewing, millinery, cooking, catering and power machine work for girls. For boys, work in cabinet making, woodwork, house construction, concrete work and printing is offered.

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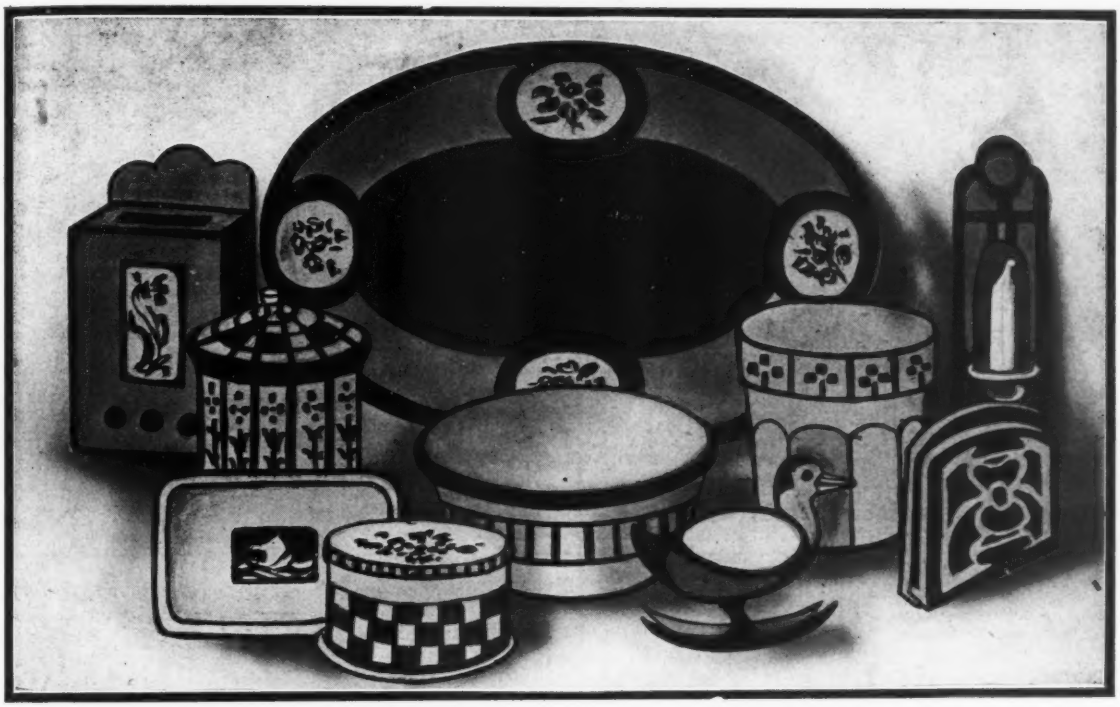

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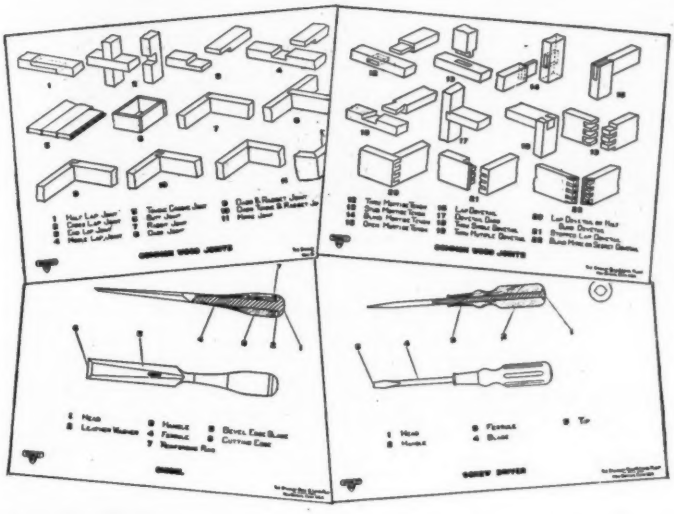

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Industrial Courses. The manual training department has occupied the structure formerly used by the domestic science classes at Middletown, O. New courses in electricity and automobile mechanics have been added this year.

Industrial Arts Department Expanded. The industrial arts department at East Waterloo, Ia., has been expanded with the erection of a new shop to house an automobile mechanics class. It also offers facilities for work in sheet metal.

The work which begins with ninth grade classes, covers 65 minutes per day. The other work of the department includes benchwork in wood, wood turning, factory practice, printing and mechanical drawing.

Mechanical Drawing Course. A course in elementary drawing is offered to boys of the sixth grade at West Warwick, R. I. A complete change in the grade drawing program has been made with the opening of the new year. Large enrollments have been reported in wood working and sewing classes. Wood working is a required subject for high school freshmen boys, as well as mechanical drawing in scientific courses. Sewing and cooking are required for entering girl students. Drawing is required for all general course girl students.

The Story of a Motor Truck. "The Story of a Motor Truck" is the latest addition to an extensive series of industrial motion picture films prepared by the Pennsylvania Department of the Interior, through the Bureau of Mines. A complete three-reel film tells the story of the many interesting and spectacular operations entering into the manufacture of this important vehicle of transportation. Animated photography is used to bring out in a graphic manner the principle of operation of various parts of the motive machinery of a motor truck. There is also shown a vivid comparison of the various parts of the motor truck to those of a passenger-carrying automobile. Copies of the film may be obtained by addressing the Department of Interior, Bureau of Mines, Pittsburgh, Pa.

Re-Educate Soldiers. The Bemidji, Minn., board of education has cooperated with the United States Veteran Bureau for the re-education and establishment of a group of 34 disabled soldiers on farm projects in northern Minnesota. The period of training covers two years, and at the end of this time each veteran will own his farm, free from debt, and under active cultivation.

Complete Unit Trade Courses. At Erie, Pa., 91 students successfully completed the two-year unit trade courses last spring. Twenty-six trade classes have been organized for the accommodation of five hundred students.

Automotive Repair Classes. At the East High School, Erie, Pa., two automotive repair classes and two machinist trade classes have been organized on an alternate week basis. First year and second year students exchange places each week.

Teachers Visit Graduates. At Erie, Pa., two days are set apart at the close of the first semester for the trade instructors to visit graduates of their courses in the local industries. The purpose of the visits is to aid in the future placement of students; to strengthen and to improve the present trade courses, and to keep in closer touch with the progress of the trade course and industry in general. At the opening of the term in the fall, the trade instructor visits the home of the new first year student. About twenty boys enroll each year.

Mr. Frank H. Shepherd, formerly at the agricultural college, Corvallis, Ore., has accepted the position of Director of Vocational Guidance and Placement for the Chicago League for the Hard of Hearing.

In his new work, Mr. Shepherd will conduct industrial surveys, extend counsel and advice to the hard of hearing or deaf, broaden the opportunities for employment service, and supervise the several activities in the direction of training for vocational employment.

Mr. Shepherd holds the degrees of Ph.B., and A.M., and is well equipped by training and experience for supervising work in the wood working and metal working lines. He is active in the deliberations of the vocational department of the N. E. A. and at one time held the office of president of the association. He is also a contributor to periodical literature in the form of papers on vocational and rehabilitation subjects.

Mr. S. M. McDonald, director of manual training at Burkburnett, Tex., has resigned to go into commercial work.

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PERSONAL NEWS.

Mr. Charles W. Thomas, formerly at the Peabody High School, has accepted the position of printing teacher at the Westinghouse High School, Pittsburgh, Pa.

Mr. Paul A. Fritzsche, of the Hazelwood elementary school, has become head of the wood working and drawing departments at the Gladstone Junior High School, Pittsburgh, Pa.

Mr. Gerald J. Donahoe has been appointed teacher of printing at the Peabody High School, Pittsburgh, Pa.

Mr. Albert H. Vogt has been placed in charge of the general metal working shop at the Gladstone Junior High School, Pittsburgh.

Mr. Paul F. Sullivan has been placed in charge of the printing department at the Perry Junior High School, Pittsburgh, Pa.

Mr. B. M. Haag of Williamsport, Pa., has been placed in charge of the electrical work at the Gladstone Junior High School, Pittsburgh, Pa.

Mr. Donald McDonald is instructor in automobile mechanics at the Watt School, Pittsburgh, Pa.

Mr. Emery G. Wolfe of Harrisburg, Pa., has been appointed teacher of printing at the North Continuation School, Pittsburgh, Pa.

Mr. Carl E. Vetter of Homestead, Pa., has become teacher of mechanical drawing and woodwork in the Snodgrass School, Pittsburgh, Pa.

Mr. Luther W. Richards of the Liberty school, Pittsburgh, Pa., has been placed in charge of the wood working shop at the Langley High School.

Mr. Albert C. Ritchey, formerly a grade school instructor, has been appointed instructor in the general metal working shop at the Langley junior-senior high school, Pittsburgh, Pa.

Miss Frances Burnham and **Miss Hazel Kenyon** of West Warwick, R. I., have accepted positions as assistant drawing teachers at Providence.

Mr. W. A. Grinnell of West Warwick, R. I., has been re-elected supervisor of drawing and manual arts for the new school year.

Mr. H. F. Jennerjohn, who last year taught mechanical drawing and wood working at Raleigh, N. C., has been made business manager to the superintendent.

Mr. Robert Van Sickle of Frankfort, Ind., has been engaged to teach drawing and wood working at Raleigh, N. C.

Mr. Jacob Wade of Campbellsburg, Ind., has been appointed instructor in sheet metal work and electricity, at Raleigh, N. C.

Mr. O. J. Flickinger is assistant to Mr. L. J. Edmunds in the manual arts department at Royal Oak, Mich.

Miss Emeline S. Whitcomb has been selected as specialist in home economics for the United States Bureau of Education.

Miss Mabel J. Chase, supervisor of art for many years at Newark, N. J., has resigned. At retirement, her co-workers presented her with a leather traveling bag.

Mr. J. Neal Dow of Canterbury has been placed in charge of manual training work in the north end section of St. John, N. B. Canada, and Mr. C. H. Cochrane in charge of the work on the west side. The work in the central school is being carried out under the direction of Mr. A. G. Gunter and Miss Bessie E. Holden. Mr. Gunter is director of manual arts work for the entire city.

Mr. Emil Fisher of Indiana University, has been employed as printing instructor in the high school at Logansport, Ind. Mr. Fisher succeeds Mr. Herbert Warfel who has gone to Joliet, Ill.

Miss Ann Love of Pittsburgh, Pa., is teacher of cooking in the Gridley junior high school, Erie.

Miss Verna Criss of St. Mary's, Pa., has become cooking teacher at the Roosevelt junior high school, Erie.

Mr. W. Harold Gossett, formerly a teacher of manual training at Indianapolis, Ind., has become assistant director of vocational education and manual training in the same city. Mr. Gossett is a graduate of the Emmerich Manual Training High School, Indianapolis, Stout Institute, Menomonie, Wis., and completed a

MR. W. HAROLD GOSSETT,
Assistant Director of Vocational Education, Indianapolis.

summer course at Bradley Polytechnic Institute in 1911-12. He has been a teacher in the Indianapolis schools for eleven years and prior to that time had taught at Quincy, Ill.

Mr. J. H. Hawkins has been appointed director of manual arts at Danville, Ill., to succeed L. A. Tuggle.

Mr. R. E. Trotter, a graduate of the Indiana State Normal, has been engaged to teach wood working in the Miami Vocational Schools, Miami, Fla.

Mr. Roy Randall, of Niles, Mich., has assumed charge of the printing course in the Miami Vocational School, Miami, Fla.

Mr. Robert Smith has been engaged to teach architectural and mechanical drawing in the high school at Miami, Fla.

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ANNOUNCE PROGRAM FOR INDIANA VOCATIONAL SOCIETY.

President Z. M. Smith has announced the tentative program for the annual meeting of the Indiana Society for Vocational Education, to be held October 18th, at Indianapolis. The program is divided into eight distinct sections, comprising industrial arts, automobile mechanics, electricity, drafting, machine shop practice, home economics work, vocational agriculture, and vocational education.

Issue News-Bulletin. The Manual Arts Association of Illinois, in the interest of the teacher constituency, has issued the first number of the News-Bulletin, a four-page pamphlet, intended to outline the history and purposes of the association and the plans for the next annual meeting in October. The pamphlet which is printed in a simple, yet attractive style, contains on its cover, a reproduction of the famous Harkness Memorial Tower of Yale University, erected by James Gamble Rogers, architect.

Increased Enrollment. The industrial department of the Bound Brook High School at Bound Brook, N. J., has experienced a fifty per cent increase in enrollment this year. The department is each year adding to its available equipment in order that new activities may be provided to more fully meet the demands for diversified industrial education. The department takes as its slogan that each student shall have completed such training as will better fit him for his chosen occupation after the educational training has been completed.

Manual Arts Work Enlarged. A greater interest in manual training work has been manifested at Stillwater, Okla. The new junior high school provides good shop facilities and it is planned to provide a separate shop building for the senior high school in the near future.

BUYERS' NEWS.

Simonds Economic Prize Awards. The prize awards in the Simonds Economic contest for 1923 have been announced. The subject of the essay was "The Lack of Economic Intelligence" and high schools and normal schools from various sections of the United States and Canada participated. The first prize of $1,000 was won by John J. Borchardt of Brooklyn, N. Y., and the second prize of $500 by Morris Saltzman of Brooklyn, N. Y. The winner of the first prize is 18 years of age and the winner of the second prize is 17 years old. They both graduated from the Commercial High School of Brooklyn, N. Y., last June.

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New Oliver Grinder. The Oliver Machinery Company has just announced the perfecting of a new variety oil stone tool grinder which is arranged to meet the widest variety of uses in manufacturing plants and school shops. The grinder is known to the trade as Oliver 585 and is equipped with two oil stone wheels which are kept constantly saturated with kerosene or other oil. The machine also includes an emery wheel, an emery cone and a leather stropping wheel. It is fully equipped with tool rests and is driven with a motor adapted to either alternating or direct current. It may be run from any lamp socket. Complete circulars describing the machine are obtainable on request.

NEW TRADE PUBLICATIONS.

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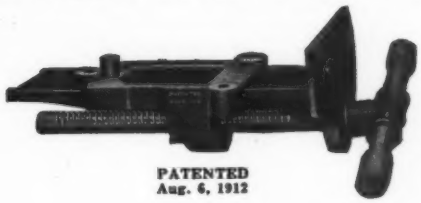

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Miehle Ptg. Press & Mfg. Co.

PRINTING SUPPLIES
American Type Founders
American Printing Ink Co.
Barnhart Bros. & Spindler
Empire Type Foundry

PUNCHES
Cincinnati Tool Company, The
Niagara Machine & Tool Works

RADIO APPARATUS
Rowles Co., E. W. A.

RULES
Dietzgen Co., Eugene
Goodell-Pratt Company
Pease Company, C. F.
Rowles Co., E. W. A.
Stanley Works
Starrett Co., L. S.
Weber Company, F.

SANDERS
Porter Cable Machine Co., The

SAWS
Atkins & Company, E. C.
Crescent Machine Company, The
Disston & Sons, Henry
Gallmeyer & Livingston Co.
Hall & Brown Woodworking Mach. Co.
Huther Bros., Saw Mfg. Co.
Millers Falls Co.
Oliver Machinery Company
Racine Tool & Machine Co.
Starrett Co., The L. S.
Simonds Saw & Steel Co.
Wallace & Co., J. D.

SAW BENCHES
American Saw Mill Machinery Co.
Gallmeyer & Livingston Company
Hall & Brown Woodworking Mach. Co.
Oliver Machinery Co.
Sidney Machine Tool Company
Wallace & Co., J. D.

SCREW DRIVERS
Cincinnati Tool Company, The
Disston & Sons, Henry
Goodell-Pratt Company
Jennings Mfg. Co., Russell
Millers Falls Company
Starrett Co., The L. S.

SEWING TABLES
Christiansen, C.

SHAPERS—METAL WORKING
Steptoe Co., John

SHEARS
Niagara Machine & Tool Works.

SHEET METAL MACHINERY
Johnson Gas Appliance Company

SHEET METAL TOOLS
Berger Bros. Co.
Johnson Gas Appliance Company
Niagara Machine & Tool Works

SQUARES
Disston & Sons, Inc., Henry
Stanley Rule & Level Co.
Starrett Co., L. S.

STAINS
Grand Rapids Wood Finishing Co.
Johnson & Son, S. C.
Marietta Paint & Color Co.

TINSMITH'S TOOLS
Berger Bros. Co.
Niagara Machine & Tool Works

TOOLS
Atkins & Company, Inc., E. C.
Cincinnati Tool Company, The
Disston & Sons, Inc., Henry
Goodell-Pratt Company
Hammacher, Schlemmer & Co.
Greenfield Tap & Die Corp.
Gross Hdwe. & Supply Co., Philip
Millers Falls Company
Morrill, Inc., Charles
Porter-Cable Machine Company
Starrett Company, L. S.
Vaughan & Bushnell Mfg. Co

TOOL GRINDERS
Atkins & Company, Inc., E. C.
Greenfield Tap & Die Corp.
Mummert-Dixon Co.
Oliver Machinery Co.

TOY MAKING SUPPLIES
Dank & Company, M. Carlton

TYPE
American Type Founders
Barnhart Bros. & Spindler
Empire Type Foundry Co.

UPHOLSTERING SUPPLIES
Cincinnati Tool Co., The
Rauch & Co., F. A.
Thurston Manual Training Supply Co.

VARNISHES
Grand Rapids Fibre Cord Co.
Johnson & Son, S. C.
Marietta Paint & Color Co.

VISES
Bemis A. L.
Columbian Hardware Co., The.
Goodell-Pratt Company
Millers Falls Company
Parker Co., Charles, The

VISES—WOODWORKERS'
Abernathy Vise & Tool Co.
Christiansen, C.
Columbian Hardware Co., The.
Oliver Machinery Company
Parker Company, The Charles

WATER COLORS
American Crayon Company
Bradley Company, Milton
Binney & Smith Co.
Weber Company, F.

WAX CRAYONS
American Crayon Company
Bradley Company, Milton
Binney & Smith Co.
Dixon Crucible Company, Joseph
Weber Company, F.

WEAVING MATERIALS
Grand Rapids Fibre Cord Co.

WEAVING SUPPLIES
Thurston Manual Training Supply Co.

WOODWORKING MACHINERY
American Saw Mill Machinery Co.
Amer. Woodworking Mach. Co.
Black Brothers Co., The
Crescent Machine Company, The
Gallmeyer & Livingston Company
Greenfield Tap & Die Corp.
Hall & Brown Wdwkg. Mach. Co.
Mattison Machine Works.
Oliver Machinery Co.
Racine Tool & Machine Co.
Sidney Machine Tool Company
Smith Machine Co., H. B.
Steptoe Company, John
Wallace & Co., J. D.

WOOD FINISHES
Grand Rapids Wood Finishing Co.

WRENCHES
Cincinnati Tool Company, The
Greenfield Tap & Die Corp.
Vaughan & Bushnell Mfg. Co.

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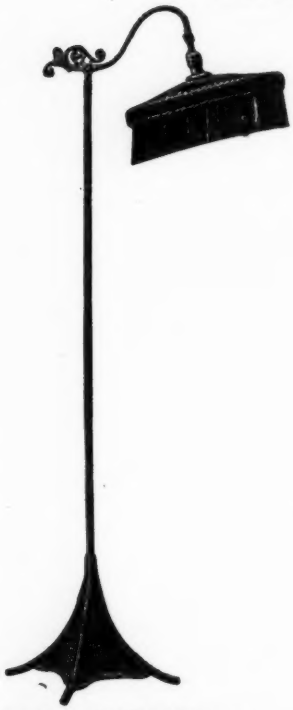

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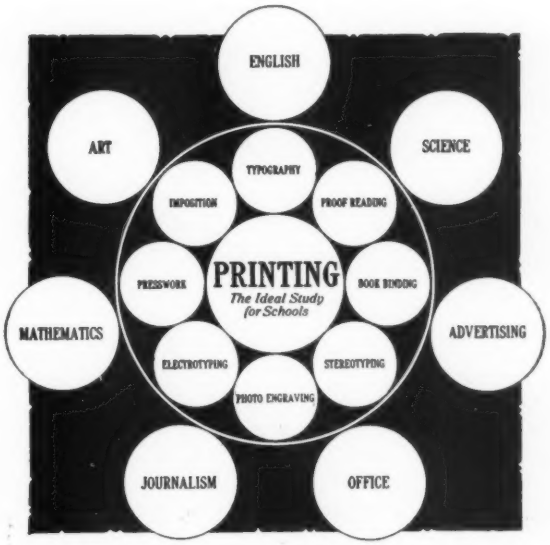

Relation of PRINTING *to Other Subjects of the Curriculum*

English

Sentence construction, spelling, punctuation, capitalization, division of words, paragraphing, compound words, writing essays for school paper.

Art

Study of color harmony and application of color to the printed page. Design as applied to printing. Relation of type to shape of page. Study of proportion, balance, tone harmony and ornamentation, spacing, handlettering, mechanical drawing, making layouts.

Journalism

Writing articles for school paper; editing copy prepared for publication (embodying in a general way the subject of English).

Office

Finding cost of production and calculating correct profits; becoming acquainted with efficiency systems, keeping records, filing, general office requirements.

Mathematics

As applied to type spacing, point and pica system of type measurement, estimating cost of composition of straight matter and job printing, amount of paper required for a job and the cutting of it, the measurement of type masses, relative sizes of type, total cost of production.

Science

Analysis of printing inks, of type metals—lead, tin, antimony, copper (used in the alloying of type metals), mechanical motions and frictions, electrotyping, stereotyping, photoengraving, bookbinding.

Advertising

Psychology of advertising; typography and English of advertising; economical implications; interpretations of principles involved; the relation of theory and practice as related to advertising; mechanical make-up; emphasizing thought; proper methods of finding proportion.

Prepared by the EDUCATIONAL DEPARTMENT

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Manufacturers and Merchants of SCHOOL PRINTING EQUIPMENT

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Kansas City Saint Paul Seattle Vancouver, B. C.

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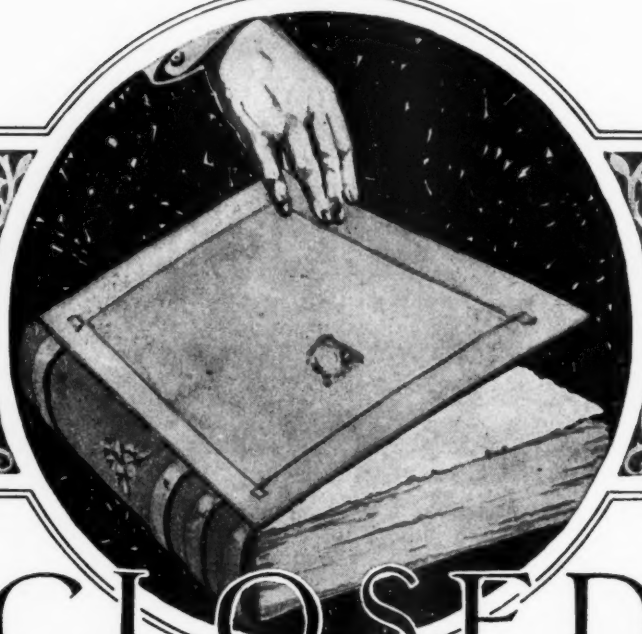

CLOSED

The Essay Contest, which closed September 10th, 1923, exceeded our expectations both as to numbers of entrants and fulfillment of purpose.

Hundreds of teachers of woodworking and vocational directors, having this subject in their charge, submitted essays from all parts of the United States and many other countries.

The entrants did full justice to their subject and no expense will be spared in publishing the winning essays in book form so as to provide the educational world with the best opportunity to enjoy their value.

To those who have contributed to the overwhelming success of the campaign, we extend our thanks and appreciation for their valuable co-operation.

Announcement of the names of the winners can be expected in the near future.

American Wood Working Machinery Company

Educational Department

ROCHESTER, NEW YORK